

2-28-2023

Developing a New Tool for Early Detection of the Nutritional and Health Risk Factors of Urban Workers' Productivity

Hildagardis Meliyani Erista Nai

Department of Nutrition, STIKes Panti Rapih Yogyakarta, Sleman, Indonesia, meliyaninai@gmail.com

Arimbi Karunia Estri

Department of of Nursing, STIKes Panti Rapih Yogyakarta, Sleman, Indonesia, arimbikarunia_estri@stikespantirapih.ac.id

Christina Ririn Widiанти

Department of of Nursing, STIKes Panti Rapih Yogyakarta, Sleman, Indonesia, ririn_widiанти@stikespantirapih.ac.id

Follow this and additional works at: <https://scholarhub.ui.ac.id/kesmas>



Part of the [Biostatistics Commons](#), [Environmental Public Health Commons](#), [Epidemiology Commons](#), [Health Policy Commons](#), [Health Services Research Commons](#), [Nutrition Commons](#), [Occupational Health and Industrial Hygiene Commons](#), [Public Health Education and Promotion Commons](#), and the [Women's Health Commons](#)

Recommended Citation

Nai HM , Estri AK , Widiанти CR , et al. Developing a New Tool for Early Detection of the Nutritional and Health Risk Factors of Urban Workers' Productivity. *Kesmas*. 2023; 18(1): 41-49

DOI: 10.21109/kesmas.v18i1.6359

Available at: <https://scholarhub.ui.ac.id/kesmas/vol18/iss1/6>

This Original Article is brought to you for free and open access by the Faculty of Public Health at UI Scholars Hub. It has been accepted for inclusion in Kesmas by an authorized editor of UI Scholars Hub.

Developing a New Tool for Early Detection of the Nutritional and Health Risk Factors of Urban Workers' Productivity

Hildagardis M E Nai^{1*}, Arimbi Karunia Estri², Christina Ririn Widianti²

¹Department of Nutrition, STIKes Panti Rapih Yogyakarta, Sleman, Indonesia, ²Department of Nursing, STIKes Panti Rapih Yogyakarta, Sleman, Indonesia

Abstract

Nutrition and health play vital roles in work productivity. This study aimed to develop a risk self-assessment tool called *Deteksi Dini Faktor Risiko Gizi dan Kesehatan (DDR-GizKes)* for early detection of the nutritional and health risk factors of urban workers' productivity. This study was conducted in two stages: 1) the development of the tool to determine the nutritional and health risk factors affected productivity based on literature reviews and scoring systems; and 2) the testing of validity and reliability. Finally, the tool contained 63 items, including 28 items on nutritional risk factors and 35 items on health risk factors. The validity of the tool was assessed using the content validity index (CVI): item-level CVI (I-CVI) and scale-level CVI (S-CVI) and face validity index (FVI), and its reliability was using Cronbach's alpha coefficient. Preliminary versions of this tool showed a high content validity (I-CVI = 1.00; S-CVI based on the average method = 1). The face validity index among urban workers was at least 0.90, and the overall Cronbach's alpha coefficient was 0.70. The tool developed is acceptable, but revisions are still needed, and sample sizes must be increased.

Keywords: health, nutrition, productivity, urban workers

Introduction

Increasing work productivity has become the most important goal for sustainable economic growth. Accordingly, there is a growing interest in what determines work productivity and how to increase it.¹ A previous study found that physical inactivity and unhealthy eating behaviors are responsible for the loss of productivity from two sources: absenteeism (due to illness or disability) and decreased productivity while working.² Furthermore, an unhealthy diet and a sedentary lifestyle are risk factors for the emergence of noncommunicable diseases (NCDs). These diseases are a crucial factor that may reduce worker's productivity.³ In addition, many workers experience both overnutrition and undernutrition, impacting the workers' health and risk of work accidents and cardiovascular disease.⁴

Diet without considering nutritional adequacy can cause obesity, including central obesity, which is also a risk factor for the emergence of NCDs such as cardiovascular disease, type 2 diabetes mellitus, musculoskeletal disorders (especially osteoarthritis), and several types of cancer.⁵ The coronavirus disease (COVID-19) pande-

mic has exacerbated NCDs. Furthermore, COVID-19 patients with NCDs are much more likely to develop a more severe illness than average patients and to die than patients without NCDs.⁶

The NCDs also negatively impact patients, caregivers, and the community in terms of the quality of life and economy.⁷ Patients spend heaps of money on nursing and treatment. A systematic review has shown that the average total costs per year for a patient/household in low- and middle-income countries concerning chronic obstructive pulmonary disease, cardiovascular disease, cancer, and diabetes mellitus were USD 7,386.71, USD 6,055.99, USD 3,303.81, and USD 1,017.05, respectively.⁸

Currently, the most significant challenges that may increase the incidence of NCDs are urbanization, diet, work, and lifestyle.⁹ Urban environments in low- and middle-income countries face a triple health burden of communicable diseases, NCDs, mental health problems, and injuries, which could be worse in the future and accelerate the increase in the incidence of overweight and obesity over the past few decades.¹⁰ This increase has

Correspondence*: Hildagardis M E Nai, Department of Nutrition, STIKes Panti Rapih Yogyakarta, Tantular Street No.401, Pringwulung, Condongcatur, Depok, Sleman, Special Region of Yogyakarta, Indonesia 55285, E-mail: meliyaninai@gmail.com, Phone: +62-821-36572804

Received : November 20, 2022
Accepted : February 20, 2023
Published : February 27, 2023

been triggered by rising urban incomes, and changes in consumption patterns wherein urban consumers consume more sugar, fat, oil, and processed foods.¹¹ In addition, urban environments are also associated with a sedentary lifestyle and fewer opportunities to practice physical exercise.¹²

The NCDs kill 41 million people yearly, equivalent to 74% of all deaths globally.¹³ Each year, 17 million people die of NCDs before the age of 70 years; 86% of these premature deaths occur in low- and middle-income countries.¹³ The NCDs may reduce workers' productivity,³ because sickness or work absenteeism owing to illness hinders the achievement of workplace organizational goals. The workplace then experiences losses, impacting national economic conditions.¹⁴ Conversely, workers' lifestyles may also trigger the emergence of NCDs. A previous study has reported a few NCD risk factors among working women,¹⁵ including low physical activity, sedentary lifestyle, and poor dietary habits, such as skipping breakfast, frequent snacking, junk food consumption, and low intake of vegetables and fruits.¹⁵

Early detection of nutritional and health status conditions can identify the onset of diseases that impact workers' productivity. Furthermore, impacts and problems related to nutritional status and fatigue experienced by workers affect productivity in the short, medium, and long terms.¹⁶ Existing studies in the literature are limited to cross-sectional studies of the relationship between nutritional and health factors and NCDs and workers' productivity.^{9,17,18}

Deteksi Dini Faktor Risiko Gizi dan Kesehatan (DDR-GizKes) is a tool containing questions on the nutritional and health factors that affect urban workers' productivity. It was developed by three lecturers at STIKes Panti Rapih Yogyakarta based on previous findings for early detection of the nutritional and health risk factors of urban workers' productivity. The tool was based on the World Health Organization STEPwise approach to surveillance (STEPS).¹⁹ In this study, the following nutritional factors were added to the tool: dietary diversity, food adequacy, variations in protein consumption, sugar consumption, and breakfast habits, in addition to a health factor—sleep duration at night. These factors, related to NCDs and workers' productivity, are excluded in the STEPS. This study also developed a scoring system to determine nutritional and health risk scores, which aimed to develop a risk self-assessment tool, named DDR-GizKes, for early detection of the nutritional and health risk factors of urban workers' productivity. Detection, screening, and treatment of NCDs are key components of the response to NCDs.¹³ Therefore, this study is urgently needed and can be a preliminary study for future studies.

Method

This study used a cross-sectional survey design. The population was civil servants in the Yogyakarta City, particularly staff of service and district officials. Permanent workers aged ≥ 20 years who were not on a diet for certain diseases and not pregnant (for female workers) were included. A total of 220 staff participated in the reliability test of the tool. The sample size was calculated based on sample size tables for Cronbach's alpha test. The alpha coefficient was 0.05; power, 90.0% (nb); the number of items, 60; Cronbach's alpha coefficient in the null hypothesis (CA0), 0.50; and Cronbach's alpha coefficient in the alternative hypothesis (CA1), 0.65. Based on the table, the minimum sample size required was 170. A total of 220 participants were included and filled in the data completely. The face validity test was conducted before the reliability test. Of 20 educators at STIKes Panti Rapih Yogyakarta with different locations of residence (urban or rural), levels of education, and types of work were selected via purposive sampling for initial testing of the face validity to understand the items.

The sampling technique used was multistage random sampling consisting of random clusters and simple random sampling. Random cluster sampling was used to select service and district office clusters. Eight service offices (Tourism Office; Education, Youth, and Sports Office; Social, Workforce, and Transmigration Office; Library and Archives Office; Population and Civil Registry Office; Public Works, Housing, and Residential Area Office; Land Registry and Spatial Planning Office; and Fire Fighting and Rescue Office) and two district offices (Pakualaman and Gondomanan District Offices) in Yogyakarta City were selected for the sampling. Moreover, random sampling was considered based on a list of names of staff from each office. However, several offices could not furnish a list of staff; therefore, only those who met the inclusion criteria were included.

There were two main variables in this study: nutritional and health factors, which were measured by determining the sub-variables, indicators, and items. This study developed a tool for the early detection of the nutritional and health risk factors of urban workers' productivity. The tool was developed based on previous literature examining the relationship between nutritional and health factors and NCDs,^{9,17} nutritional and health factors affecting productivity,¹⁸ aspects of nutrition and health in urban areas,¹¹ and STEPS.¹⁹ The tool contained items on nutritional and health risk factors. Each item was tested for its content validity, face validity, and reliability.

The sociodemographic characteristics of the participants evaluated in the reliability test included age (20–29, 30–39, 40–49, and ≥ 50 years); sex; education (did not complete elementary school, completed elementary school, completed junior high school, completed senior

high school, completed a diploma program, completed bachelor's program, completed master's program, and completed doctoral program); monthly income (IDR <2,000,000; 2,000,000–3,999,999; 4,000,000–5,999,999; 6,000,000–7,999,999; and ≥8,000,000); and marital status (married and single/divorced). A structured questionnaire was used to collect data on these sociodemographic characteristics.

The study was conducted in two stages. The first stage was developing the risk self-assessment tool and risk scores. The tool was developed based on existing studies, including those 1) identifying research variables; 2) dividing these variables into sub-variables/dimensions; 3) identifying indicators/aspects of each sub-variable; 4) formulating the descriptor of each indicator; 5) formulating each descriptor into question items; and 6) equipping the instrument with charging instructions and prefaces.²¹⁻²³ The items were developed based on existing indicators. Items on nutritional factors were developed based on previous findings, and items on health factors based on question items previously developed, such as physical activity and alcohol consumption.^{19,24} The physical activity and alcohol consumption items were translated into the Indonesian language by the Language Unit at the Faculty of Education, Universitas Negeri Yogyakarta. The risk score was developed using the category of each indicator.

The DDR-GizKes consisted of items on nutritional factors (dietary diversity, food adequacy, variety of protein sources, amount of sugar consumption, frequency of high-sugar food or drink consumption, amount of salt consumption, frequency of high-salt food or drink consumption, frequency of breakfast, type of food for breakfast, amount of water consumption, abdominal circumference, waist circumference, hip circumference, and body mass index) and health factors (physical activity, smoking behavior, alcohol consumption, and sleep duration). The scoring system used was a three-level category (0, 5, and 10).²⁵ For the nutritional risk factors, a score of 0 with each indicator indicated a risk of undernutrition; 5, normal nutrition; and 10, a risk of overnutrition associated with NCDs. For the health risk factors, a score of 0 with each indicator indicated a low health status; 5, good health status; and 10, high health status related to NCDs.

The second stage was testing the validity and reliability of DDR-GizKes. Both content and face validities were assessed. Content validity generally refers to the validity estimated by testing the feasibility or relevancy of test contents through rational analysis by a competent panel or expert judgment.²⁶ The content validity was evaluated in six steps, as previously described.²² First, a validity form was prepared to ensure that expert panel reviewers clearly understood the task assigned by the authors. Thereafter, each indicator was assigned to help experts assess the question items based on the indicator definition. Second,

expert reviewers were selected. The expert panel must have included at least three reviewers, had experience of at least 10 years, and been experienced in conducting surveys and questionnaires and/or utilizing substantive materials.^{23,27}

Third, the content validity was assigned by the expert reviewers. Typically, the content validity could be evaluated face-to-face or non-face-to-face with a panel of experts.²² This study adopted both approaches. Two expert reviewers were met directly, and one was sent a review format. Fourth, the domain and item in question were reviewed. The expert reviewers were asked to critique the domain reviewed and its items before assigning a score to each item and providing a written comment to increase the item's relevance to the target domain. Fifth, each item was assigned a score, and sixth, the content validity index (CVI) was calculated. The face validity reflected the clarity and understandability of question items. Herein, the workers were asked to score from 1 (item not clear and not understandable) to 4 (item very clear and understandable) based on the clarity and comprehensibility of the items in DDR-GizKes.²⁸ Cronbach's alpha coefficient was used to assess reliability.

A univariate analysis was performed to evaluate the participant characteristics, which were described in frequencies and percentages. The content validity was assessed using the CVI which is the recommended and most commonly-used parameter for quantitatively calculating content validity.^{26,28} Three expert reviewers rated each item on a Likert scale ranging from 1 (e.g., irrelevant or non-representative) to 4 (e.g., highly relevant or highly representative). Before the CVI was calculated, the relevance rating was re-encoded as 1 (relevance scale 3 or 4) or 0 (relevance scale 1 or 2). Items with a rating of 1 and 2 were considered invalid, while items with a rating of 3 and 4 were considered valid.^{22,29} Two forms of the CVI were utilized: item-level CVI (I-CVI) and scale-level CVI (S-CVI). The S-CVI was calculated using the universal agreement (UA) among experts (S-CVI/UA) and the average CVI (S-CVI/Ave). An I-CVI of 0.78 and S-CVI/Ave of ≥0.90 indicated good content validity.²⁸

The face validity index (FVI) assessed the completeness and clarity of each item. Before the FVI was calculated, the comprehension rating was re-encoded as 1 (comprehension scale 3 or 4) or 0 (comprehension scale 1 or 2). For the FVI, ratings of 3 and 4 were recategorized as 1 (clear and understandable) and ratings of 1 and 2 as 0 (unclear and understandable).²⁸ The formula used for calculating the FVI was $FVI = (\text{summation of FVI score}) / (\text{max score} * \text{number of raters})$.²⁹

Internal consistency was measured to determine the reliability of the two variables of DDR-GizKes using Cronbach's alpha coefficient for the subscale and overall scale. Data from the 220 participants were entered into

the statistical analysis data software. Cronbach’s alpha coefficients of ≤ 0.60 indicated low reliability and were con-

sidered unacceptable; 0.60–0.80 indicated moderate reliability and was considered acceptable; 0.80–1.00 indica-

Table 1. Sub-Variables, Risk Factors, Criteria, and Scoring of the Tool Items

Variable	Sub-variable	Indicator/risk Factor	Scoring Criterion	Score	
Nutritional factor	Dietary diversity ³¹	Poor dietary diversity	<4 types of food group/day	0	
			≥ 4 types of food group/day	5	
	Food adequacy ³¹	Inadequate carbohydrate intake		<3 servings/day	0
				3–4 servings/day	5
		Inadequate animal protein intake		>4 servings/day	10
				<2 servings/day	0
		Inadequate vegetable protein intake		2–4 servings/day	5
				>4 servings/day	10
				<2 servings/day	0
	Inadequate fruit intake		2–4 servings/day	5	
			>4 servings/day	10	
			<3 servings/day	0	
	Inadequate vegetable intake		≥ 3 servings/day	5	
			<3 servings/day	0	
			≥ 3 servings/day	5	
	Variety of protein source ³¹	Invariable consumption of protein-source foods	<3 different sources/day	0	
			≥ 3 different sources/day	5	
	Amount of sugar consumption ³¹	Excess sugar consumption		≤ 4 tablespoons/50 g	5
				>4 tablespoons/50 g	10
	Frequency of high-sugar food or drink consumption	High frequency of consumption of high-sugar packaged foods or beverages	Always/often	10	
		Sometimes, rarely, never	5		
Amount of salt consumption ³¹	Excess salt consumption		≤ 1 teaspoon (2,000 mg)	5	
			>1 teaspoon (2,000 mg)	10	
Frequency of high-salt food or drink consumption	High frequency of consumption of high-salt packaged foods or beverages	Always/often	10		
		Sometimes, rarely, never	5		
Frequency of breakfast	Low frequency of breakfast	Always/often	5		
		Sometimes, rarely, never	0		
Type of food for breakfast ³¹	Poor dietary diversity for breakfast	<3 types of food group/day	0		
		≥ 3 types of food group/day	5		
Amount of water consumption ³¹	Less water consumption		<8 glasses	0	
			≥ 8 glasses	5	
Abdominal circumference ³²	Abdominal circumference	Male	>90 cm	10	
			≤ 90 cm	5	
		Female	>80 cm	10	
			≤ 80 cm	5	
Waist circumference ³³	Waist circumference	Male	>94 cm	10	
			≤ 94 cm	5	
		Female	>80 cm	10	
			≤ 80 cm	5	
Hip circumference ³³	Hip circumference	Male	>102 cm	10	
			≤ 102 cm	5	
		Female	>88 cm	10	
			≤ 88 cm	5	
Body mass index ³¹	Body mass index		<18.5: underweight	0	
			18.5–22.9: normal	5	
			23.0–24.9: overweight	10	
			≥ 25 : obesity	10	
Health factor	Physical activity at work ¹⁹	Insufficient physical activity at work	Low physical activity	10	
			Moderate physical activity	5	
			High physical activity	0	
	Physical activity for transport ¹⁹	Insufficient physical activity for transport	Low physical activity	10	
			Moderate physical activity	5	
			High physical activity	0	
	Physical activity during leisure time ¹⁹	Insufficient physical activity during leisure time	Low physical activity	10	
			Moderate physical activity	5	
			High physical activity	0	
	Smoking behavior	Duration and quantity of smoking	Light smoker (0–199 cigarettes)	5	
			Moderate and heavy smokers (>200 cigarettes)	10	
	Alcohol consumption ²⁴	Alcohol consumption	Low risk (score: 0–7)	5	
Increasing risk (score: 8–20)			10		
Sleep duration ³⁴	Short duration of sleep at night	<7 hours	0		
		7–8 hours	5		
		>8 hours	10		

ted very good reliability.³⁰

Results

Stage 1: Development of the Risk Self-Assessment Tool and Risk Scores

The tool was developed based on previous literature.^{9,11,17-19} Ultimately, it contained 14 sub-variables and 18 indicators of nutritional risk factors and six sub-variables and six indicators of health risk factors. From these indicators, 63 items were obtained, including 28 items on nutritional risk factors and 35 items on health risk factors to develop early versions of DDR-GizKes (Table 1).

For the nutritional factors, the maximum score was 145, which was the combined score of each indicator. The normal value was calculated using the median value from the combined scores of all indicators. The categories of the nutritional risk factors were as follows: 0–72, risk of undernutrition; 73–90, normal nutrition; and 91–145, risk of overnutrition.

For the health factors, the maximum score was 40, which was the combined score of four indicators. Of the

three indicators of physical activity, only one was considered according to the condition of the participants. The normal value was calculated using the median value from the combined scores of all indicators. The categories of the health risk factors were as follows: 0–19, low health status; 20–21, good health status; and 22–40, high health status related to NCDs.

Stage 2: Validity and Reliability Test

The content and face validities were assessed. The results of the CVI and FVI analysis are presented in Table 2. As shown in Table 2, both the I-CVI and S-CVI were 1. This finding indicated that this tool had excellent content validity because the I-CVI meets the criteria of a minimum I-CVI of 1 for three experts. While, the S-CVI/Ave and S-CVI/UA met a satisfaction level of more than 0.90. The inter-worker FVI was 0.9–1, and the average S-FVI was 0.99. The results indicated good FVI.

Finally, at the end of the content and face validity tests, this tool was prepared with 63 items for the next steps. For the reliability test, the abdominal circumference, waist circumference, hip circumference, and body

Table 2a. Content Validity and Face Validity of the Tool

Component	Item	Input	I-CVI among Experts (n = 3)	UA	I-FVI among Employees (n = 20)	
Nutritional factor	Dietary diversity	G1	1	1	1	
		G3	1	1	1	
		G5	1	1	1	
		G7	1	1	1	
		G9	1	1	1	
	Food adequacy	G2	1	1	1	
		G4	1	1	1	
		G6	1	1	1	
		G8	1	1	1	
		G10	1	1	1	
	Variety of protein source	G11	1	1	1	
		G12	1	1	1	
		G13	1	1	1	
		G14	1	1	1	
		G15	1	1	1	
	Amount of sugar consumption	G16	1	1	1	
		G17	1	1	1	
	Frequency of high-sugar food or drink consumption	G18	1	1	1	
	Amount of salt consumption	G19	1	1	1	
		G20	1	1	1	
	Frequency of high-salt food or drink consumption	G21	Add "salty snacks"	1	1	1
	Frequency of breakfast	G22	1	1	1	
	Type of food for breakfast	G23	1	1	1	
	Amount of water consumption	G24	1	1	1	
	Abdominal circumference	G25	1	1	1	
	Waist circumference	G26	1	1	1	
	Hip circumference	G27	1	1	1	
	Body mass index	G28	1	1	1	
			S-CVI/Ave	1	-	
			S-CVI/UA	1		
			S-FVI-Ave		1	

Notes: I-CVI = Item-level Content Validity Index, UA = Universal Agreement, I-FVI = Item-level Face Validity Index, S-CVI = Scale-level Content Validity Index, Ave = Average, S-CVI/Ave = Scale-level Content Validity Index based on the Average Method; S-CVI/UA = Scale-level Content Validity Index based on the Universal Agreement Method; S-FVI = Scale-level Face Validity Index.

Table 2b. Content Validity and Face Validity of the Tool

Component	Item	Input	I-CVI among Experts (n = 3)	UA	I-FVI among Employees (n = 20)	
Health factors	Physical activity at work	K1	1	1	0.95	
		K2	1	1	1	
		K3	1	1	1	
		K4	1	1	0.90	
		K5	1	1	1	
	Physical activity for transport	K6	1	1	1	1
		K7	1	1	1	1
		K8	1	1	1	1
		K9	1	1	1	1
	Physical activity during leisure time	K10	1	1	1	1
		K11	1	1	1	1
		K12	1	1	1	1
		K13	1	1	1	1
		K14	1	1	1	1
		K15	1	1	1	1
	Smoking behavior	K16	1	1	1	1
		K17	1	1	1	1
		K18	1	1	1	1
		K19	1	1	1	1
		K20	1	1	1	1
		K21	1	1	1	1
		K22	1	1	1	1
	Alcohol consumption	K23	1	1	1	1
		K24	1	1	1	1
		K25	1	1	1	1
		K26	1	1	0.95	1
		K27	1	1	0.95	1
		K28	1	1	1	1
		K29	1	1	0.95	1
		K30	1	1	1	1
		K31	1	1	1	1
	Sleep duration	K32	1	1	1	1
K33		Add "physically injured"	1	1	1	
K34		1	1	1	1	
K35		1	1	1	1	
		S-CVI/Ave	1		-	
	S-CVI/UA		1	-		
	S-FVI-Ave			0.99		

Notes: I-CVI = Item-level Content Validity Index, UA = Universal Agreement, I-FVI = Item-level Face Validity Index, S-CVI = Scale-level Content Validity Index, Ave = Average, S-CVI/Ave = Scale-level Content Validity Index based on the Average Method; S-CVI/UA = Scale-level Content Validity Index based on the Universal Agreement Method; S-FVI = Scale-level Face Validity Index.

mass index were excluded as they were the results of direct measurements. Therefore, only 59 items were included in the reliability test.

Internal Consistency Reliability

A total of 220 workers participated in this study. Their sociodemographic characteristics are shown in Table 3. Table 3 shows that the number of female and male in this study is almost equal (50.5% and 49.5%, respectively). Most respondents are aged 40–49 years (30.5%), have completed a bachelor’s program (40.9%), earn a monthly income of IDR 2,000,000–3,999,999 (54.5%), and were married (68.6%).

As shown in Table 4, the overall Cronbach’s alpha coefficient was 0.70, whereas the specific alpha coefficients for the nutritional and health factors were 0.649 and

0.707, respectively. The overall and variable-specific Cronbach’s alpha coefficients exceeded 0.6, which was considered acceptable.

Discussion

This study examined and assessed the content validity of DDR-GizKes in terms of the nutritional and health factors of the productivity of urban workers. DDR-GizKes is a risk self-assessment tool that can help detect early nutritional and health risk factors associated with NCDs. Work productivity is influenced by factors with a significant and determining role: nutritional adequacy and health degree.⁴

In this study, dietary diversity, food adequacy, variations in protein consumption, sugar consumption, and breakfast habits, which were excluded in the previous li-

Table 3. Sociodemographic Characteristics of the Participants in the Internal Consistency Reliability Test (n = 220)

Variable	Category	n	%
Age	20–29	58	26.4
	30–39	58	26.4
	40–49	67	30.5
	≥50	37	16.8
Sex	Male	119	50.5
	Female	109	49.5
Education	Do not complete elementary school	1	0.5
	Complete elementary school	1	0.5
	Complete junior high school	2	0.9
	Complete senior high school	47	21.4
	Complete diploma program	61	27.7
	Complete bachelor's program	90	40.9
	Complete master's program	18	8.2
Monthly income	Completed doctoral program	0	0.0
	IDR >2,000,000	12	5.5
	IDR 2,000,000–3,999,999	120	54.5
	IDR 4,000,000–5,999,999	59	26.8
	IDR 6,000,000–7,999,999	21	9.5
Marital status	IDR ≥8,000,000	8	3.6
	Married	151	68.6
	Single/divorced	69	31.4

Table 4. Cronbach's Alpha Coefficients for the Tool Subscale (n = 220)

Variable	Alpha Coefficient
Nutritional factors	0.649
Health factors	0.707
Overall	0.700

temperature,¹⁹ were added as nutritional factors. The previous studies are limited to cross-sectional studies for assessing the relationship between nutritional and health factors and NCDs and workers' productivity, not developing the tool.^{9,17,18} DDR-GizKes was developed based on previous literature.^{11,17,18,31} Therefore, this study provided strong evidence for assessing the content validity of the tool.

Herein, 24 indicators were obtained from 63 question items. DDR-GizKes was developed for the urban worker population, and other elements such as motivation, skills, and income level were not considered. This tool assessed two crucial productivity determinants: nutritional and health factors. This study could serve as a preliminary investigation for future study.

The validity test was employed to evaluate the content validity of the tool in this study. Generally, the measurement of this parameter remains necessary as the initial step in an instrument's development.²⁶ This study showed that the I-CVI, S-CVI/Ave, and S-CVI/UA were equal to 1, indicating that the tool items were legitimate among the three experts. Based on the test's intended goal, the developed items could characterize the substance. The results proved that the tool contained a sufficient

number of questions and revealed that nutritional and health risk factors affected the productivity of urban workers. This study met the minimum criteria for the number of experts involved in assessing content validity: two or three experts. Further, the expert reviewers met the criteria established by previous studies.^{23,27}

A total of 63 tool items were developed with good operationalization and conceptualization, which could be used for pilot studies. However, further studies need to involve more experts to solidify the relevance of the question items. Panels must consist of survey and questionnaire experts and substantive experts/materials to develop good questionnaires and question items.^{23,27} Herein, there were difficulties in recruiting expert reviewers who were experts in the field of occupational nutrition with at least ten years of experience and developing questionnaires. Six experts who were contacted were not willing to participate as experts.

The FVI indicated the ease of comprehension of question items. In this study, the FVI ranged from 0.95 to 1. Several questions might be challenging to comprehend, such as K1, K4, K26, K27, and K29. Some revisions were made by adding information and modifying sentences. The alpha coefficient of the nutritional factors was lower, whereas that of the health factors and the overall score were higher. The alpha coefficients of more than 0.6 shows an acceptable internal consistency.³⁰ A low alpha coefficient could be attributed to a small number of questions, poor interrelatedness between items, or heterogeneous constructs. Herein, the low alpha coefficient could be related to the small number of questions; hence, some items needed to be either revised or deleted.³⁵

In this study, the questions on nutritional factors (24 items) were fewer than those on health factors (35 items). However, increasing the number of questions may increase the total number of questions, which might cause respondents to feel bored in answering the questionnaire. Thus, developed questions may be revised, or the minimum sample size may be increased. The minimum sample size was met in this study; however, a larger sample size is recommended. The overall score was 0.70, which indicated an acceptable internal consistency.

The strength of this study was that it succeeded in developing a tool and scoring system for early detection of the nutritional and health risk factors of productivity of urban workers. This study added nutritional and health factors for NCDs that have not been used in previous studies. Therefore, it can be a preliminary study for subsequent similar studies. The weakness of this study was an insufficient minimum of sample size; therefore, it is necessary to include more experts in the assessment.

Conclusion

DDR-GizKes is a valid and acceptable tool for the

early detection of the nutritional and health risk factors of urban workers' productivity. The items developed are acceptable, but revisions are still needed. Future studies must optimize the predictive accuracy of DDR-GizKes by involving more experts and participants.

Abbreviations

NCD: Noncommunicable Disease; COVID-19: coronavirus disease 2019; DDR-GizKes: *Deteksi Dini Faktor Risiko Gizi dan Kesehatan*; CVI: Content Validity Index; FVI: Face Validity Index; I-CVI: Item-level Content Validity Index; S-CVI: Scale-level Content Validity Index; UA: Universal Agreement; Ave: Average; S-CVI/Ave: Scale-level Content Validity Index based on the Average Method; S-CVI/UA: scale-level Content Validity Index based on the Universal Agreement Method; I-FVI: Item-level Face Validity Index; S-FVI: Scale-level Face Validity Index.

Ethics Approval and Consent to Participate

This study obtained protocol and procedure approval from the Research and Community Engagement Ethical Committee of Health Science of Respati University of Yogyakarta (No. 120.3/FIKES/PL/VIII/2022). Permission to collect data in the ten offices was obtained from official authorities. Respondents who agreed to participate in this study were asked to sign an informed consent form.

Competing Interest

The authors declare that there are no significant competing financial, professional, or personal interests that might have affected the performance.

Availability of Data and Materials

The data presented in this study are available in this article.

Authors' Contribution

Conceptualization: HMEN, AKE, and CRW; Data curation: HMEN, AKE, and CRW; Formal analysis: HMEN and AKE; Methodology: HMEN and AKE; Validation: HMEN, AKE, and CRW; Writing—original draft: HMEN; Writing—review and editing: HMEN, AKE, and CRW. All authors have read and agreed to the published version of the manuscript.

Acknowledgment

The authors would like to thank the Directorate General of Higher Education, Research, and Technology of the Minister of Education, Culture, Research, and Technology of the Republic of Indonesia for providing research grants (No. 0267/E5/AK.04/2022) for this study as well as all respondents included.

References

- Okazaki E, Nishi D, Susukida R, Inoue A, Shimazu A, Tsutsumi A. Association between working hours, work engagement, and work productivity in employees: a cross-sectional study of the Japanese Study of Health, Occupation, and Psychosocial Factors Relates Equity. *J Occup Health*. 2019; 61 (2): 182–8.
- Grimani A, Aboagye E, Kwak L. The effectiveness of workplace nutrition and physical activity interventions in improving productivity, work performance and workability: a systematic review. *BMC Public Health*. 2019; 19 (1): 1676.
- SH MS, S N, AAM N. An analysis of the relationship between the productivity and the non-communicable diseases. *KALAM – International Journal*. 2021; 4 (3): 92–111.
- Bor H. The relationship between nutrition and worker efficiency. *Turkish Journal of Family Medicine and Primary Care*. 2020; 14 (2): 305–11.
- Kurniati N. Obesity and central obesity. *Med J Indones*. 2018; 27 (2): 239–42.
- Nikoloski Z, Alqunaibet AM, Alfawaz RA, Almodarra SS, Herbst CH, El-Saharty S, et al. Covid-19 and non-communicable diseases: evidence from a systematic literature review. *BMC Public Health*. 2021; 21 (1): 1068.
- Rijal A, Adhikari TB, Khan JAM, Berg-Beckhoff G. The economic impact of non-communicable diseases among households in South Asia and their coping strategy: a systematic review. *PLoS ONE*. 2018; 13 (11): e0205745.
- Kazibwe J, Tran PB, Annerstedt KS. The household financial burden of non-communicable diseases in low- and middle-income countries: a systematic review. *Health Res Policy Sys*. 2021; 19 (1): 96.
- Ismail NW, Sivadas S. Urban health and the prevalence of non-communicable diseases in Malaysia. *Mal J Med Health Sci*. 2020; 16 (2): 3–9.
- Barbiero VK. Urban health: it's time to get moving! *Glob Health Sci Pract*. 2014; 2 (2): 139–44.
- Global Panel. Urban diets and nutrition: trends, challenges, and opportunities for policy action. Policy Brief No. 9. Global Panel on Agriculture and Food Systems for Nutrition. 2017.
- Machado-Rodrigues AM, Coelho-E-Silva MJ, Mota J, Padez C, Martins RA, Cumming SP, et al. Urban-rural contrasts in fitness, physical activity, and sedentary behaviour in adolescents. *Health Promot Int*. 2014; 29 (1): 118–29.
- World Health Organization. Noncommunicable diseases. Geneva: World Health Organization; 2022.
- World Health Organization. Regional Office for Europe, Lima, Joana, Rohregger, Barbara & Brown, Chris. SDG 8: Health, decent work and the economy: policy brief. World Health Organization: Regional Office for Europe; 2019.
- Idris IB, Azit NA, Abdul Ghani SR, Syed Nor SF, Mohammed Nawi A. A systematic review on noncommunicable diseases among working women. *Ind Health*. 2021; 59: 146–60.
- Ramadhanti AA. The nutritional status and fatigue for work productivity. *Jurnal Ilmiah Kesehatan Sandi Husada*. 2020; 11 (1): 213–8.
- Timalsina P, Singh R. Assessment of risk factors of non-communicable diseases among semiurban population of Kavre District, Nepal. *J Environ Public Heal*. 2021: 5584561.
- Yunieswati W, Marliyati SA, Setiawan B. Nutritional status, health status, and work productivity of cocoa farmers in Polewali Mandar, Indonesia. *J Gizi Pangan*. 2020; 15 (3): 169–74.
- World Health Organization. The WHO STEPwise approach to non-communicable disease risk factor surveillance WHO STEPS surveillan-

- ce manual. Geneva: World Health Organization; 2020.
20. Bujang MA, Omar ED, Baharum, NA. A review on sample size determination for Cronbach's alpha test: a simple guide for researchers. *Malays J Med Sci.* 2018; 25 (6): 85–99.
 21. Anwar MI. Skala pengukuran variabel-variabel penelitian. Bandung: ALFABETA; 2018.
 22. Yusoff MSB. ABC of content validation and content validity index calculation. *EIMJ.* 2019; 11 (2): 49–54.
 23. Kalkbrenner MT. A practical guide to instrument development and score validation in the social sciences: the MEASURE approach. *Pract Assess Res Evaluation.* 2021; 26: 1.
 24. Babor TF, Higgins-Biddle JC, Saunders JB, Monteiro MG. AUDIT The alcohol use disorders identification test guidelines for use in primary care second edition. Geneva: World Health Organization; 2001.
 25. Rahmawati, Hardinsyah, Katrin Roosita. Development of balance diet indices to assess nutritional quality of the diet in Indonesian adolescents (13-15 years old). *Media Kesehatan Masyarakat Indonesia.* 2015; 11 (3): 160–7.
 26. Hendryadi H. Validitas isi: tahap awal pengembangan kuesioner. *Jurnal Riset Manajemen dan Bisnis.* 2017; 2 (2): 169–78.
 27. Ikart EM. Survey questionnaire survey pretesting method: an evaluation of survey questionnaire via expert reviews technique. *Asian J Soc Sci Stud.* 2019; 4 (2): 1.
 28. Romli R, Mohamad EMW, Abd Rahman R, Chew KT, Mohd Hashim S, Mohammed Nawi A. Translation, cross-cultural adaptation, and validation of the Malay version of the protection motivation theory scale questionnaire for pap smear screening. *Int J Environ Res Public Health.* 2022; 19 (11): 6858.
 29. Ozair MM, Baharuddin KA, Mohamed SA, Esa W, Yusoff MSB. Development and validation of the knowledge and clinical reasoning of acute asthma management in emergency department (K-CRAMED). *Education in Medicine Journal.* 2017; 9 (2): 1–17.
 30. Daud KAM, Khidzir NZ, Ismail AR, Abdullah FA. Validity and reliability of instrument to measure social media skills among small and medium entrepreneurs at Pengkalan Datu River. *International Journal of Development and Sustainability.* 2018; 7 (3): 1026–37.
 31. Menteri Kesehatan Republik Indonesia. Peraturan Menteri Kesehatan Republik Indonesia Nomor 41 Tahun 2014 Tentang Pedoman Gizi Seimbang. Jakarta: Kementerian Kesehatan Republik Indonesia; 2014.
 32. Badan Penelitian dan Pengembangan Kesehatan. Hasil Utama Risetdas 2018. Jakarta: Kementerian Kesehatan Republik Indonesia; 2018.
 33. Iqbal M, Puspaningtyas DE. Penilaian status gizi ABCD. Jakarta: Penerbit Salemba Medika; 2018.
 34. Chaput JP, Dutil C, Featherstone R, Ross R, Giangregorio L, Saunders TJ, et al. Sleep duration and health in adults: an overview of systematic reviews. *Appl Physiol Nut Metab.* 2020; 45 (10 (Suppl. 2)): S218–31.
 35. Sharma B. 2016. A focus on reliability in developmental research through Cronbach's alpha among medical, dental, and paramedical professionals. *Asian Pac J Health Sci.* 2016; 3 (4): 271–8.