Academic Study of Obesity as a National Health Problem Based on Structural Equation Model Analysis

Hertog Nursanyoto, Ni Komang Wiardani, I Putu Suiraoka, I Wayan Juniarsana and I Gusti Putu Sudita Puryana

Jurusan Gizi Politeknik Kesehatan Kemenkes Denpasar
hertognursanyoto@gmail.com

Abstract. Obesity is not a terminal problem, but is related to non-communicable diseases (NCDs). Therefore, efforts to halt the rate of increase in obesity require a holistic approach and support from all stakeholders. The formulation of the problem that will be studied is: "Is it appropriate for the problem of obesity to be made a national health problem?" This research was conducted by distributing questionnaires online to 200 respondents. The analysis was carried out using the structural equation model design method (SEM = structural equation model). The results revealed that the majority of respondents (77.7%) agreed that obesity is a serious health problem. However, establishing indicators of national health problems is not easy. It is necessary to determine the magnitude of the problem by taking into account regional characteristics, comparing it with similar problems in other countries in order to obtain internationally accepted problem standards. If it is designated as a national health problem, then efforts to overcome obesity will not be simple. The success of controlling obesity cannot stand alone, but rather depends on efforts to overcome other health problems that are directly or indirectly related to the problem of obesity. It would be better to design a composite index that describes the success of development in the field of nutrition by including the problem of obesity as one of its constituent elements.

Keywords: Obesity, Problem Indicator, Composite Index.

1   Introduction

1.1   Background

Currently, Indonesia has entered an era of problems double nutrition. On the one hand the problem of shortage nutrition in toddler Not yet fully can be resolved right, on the other hand, the problem obesity show trend increase [23]. It's important to remember that obesity isn't a terminal problem, but is closely related to non-communicable diseases (NCD) [8]. So obesity isn't just an aesthetic problem, it's like an iceberg. On the surface, it looks easy, but underneath, there are dozens of underlying issues that, if not addressed, will significantly increase state healthcare costs [16].

Realizing the serious impact that obesity has, many countries are designing programs to control it. With the assumption that the group most vulnerable to obesity is teenagers, programs are developed both school and community based. Researchers have come up with a bunch of different intervention models, like Susanne's (2018). She's created a model called SALTO, which focuses on a personal community environment. Everyone involved, like teachers and parents, as well as experts clubs, are involved in the program, and it lasts for 6 months. It's all done through social media [33]. Claudia Mazzeschi (2014) developed a multi-tiered community-based intervention model, EUROBIS, for children ranging from 5 to 16 years of age. This model covers a one-year period and includes nutrition, physical activity, and counseling to address psychological issues, including parental involvement, the local community, stakeholders, and social groups [26]. Nisha Narayanan's 2019 study developed a school intervention model called Kid-Power (KIPOW). It's based on social ecology and Social Cognitive Theory (SCT), which focuses on controlling environmental and social factors that cause obesogenic behavior [27]. The Evans Study (2016) is a comprehensive school-based obesity intervention study conducted in Texas among 7-12 year-olds. The study focuses on environmental control and the implementation of the CATCH + LGEG program. Through the study, children are taught to garden, cultivate healthy food, and become proficient in selecting food ingredients in cooking demonstrations [10]. A randomized control and trial study conducted in Lakkana (2017) was an Internet-based randomised control and trial study in which the concept of Graph Pad Quick Cal was applied to children aged 1-6 years of age in elementary school. GPQC (Graph Pad Quick Cal) was used in the study to help children learn about anthropometry, excess weight assessment, nutritional literacy and habits related to eating and physical activity delivered through the internet [32]. A school-based research project in Malaysia by Sharif Ishak (2020) uses the EpaL approach developed for teens and empowers teens to live a healthy lifestyle through increased awareness, positive attitudes and three lifestyle components: healthy diet, healthy body image, and an active lifestyle [36]. Last but not least, a randomized, controlled trial (RCT) study looking at families and communities across China, using the concept of 'The China Primary School Children Physical Activities' (CHIRPY) and 'Dragon Intervention', which is a program that integrates food delivery, healthy eating behaviors, and physical activity with parents and caregivers, and school teachers to improve the behaviors of obese children, which has impacts on body weight and BMI changes [21].

In Indonesia, efforts to control obesity have actually been outlined in the Guidelines for the Implementation of the Nusantara Movement to Reduce Obesity Rates (GENTAS) [9]. However, the targets set have not specifically touched vulnerable groups. We should all be aware of that obesity is not just an adult problem. Facts show that children and adolescents also have a high risk of obesity. According to the World Obesity Federation, in 2019, the number of children and adolescents living with obesity aged 5–19 was 206 million in 2025, and it is projected to reach 254 million by 2030. Of the 42 countries with an estimated prevalence of more than one million children with obesity by 2030, China leads the list, followed by India and the USA, followed by Indonesia and Brazil [17]. Individual behavior is a significant risk factor for obesity and overweight, however, the physical and social determinants of obesity and overweight are also extensively discussed in the literature of recent epidemiology. Environmental influences, collectively referred to as obesogenic, are iden-

tified as particularly influential, including spatial development and urban sprawl, access to nutritious food, exercise opportunities, neighborhood life, and social interactions [6]. Unbelievably, due to the prevalence of an obesogenic environment as a result of an urban lifestyle, the prevalence of obesity is highest among the poor population in the densities and slums of urban areas. [22]. It is important to note that there has recently been a reverse trend: a BMI difference between urban and rural. In developed countries, we observe that obesity is actually higher in rural areas, particularly in women. There is a pressing need to conduct integrated studies on rural nutrition, particularly those that include access to nutritious food through financial and physical means, to prevent losses caused by malnutrition. One of the disadvantages of malnutrition is an overconsumption of poor quality calories [3].

Therefore, efforts to restrain the rate of increase in obesity require a dynamic approach and are not only the responsibility of the health sector, but also need to be supported by the contributions of other stakeholders. A successful intervention reflects not only the efficiency of the intervention, but also the reach of the intervention within society and the degree of implementation of the innovation to a high degree of detail and depth [24]. Despite almost 20 years of advice from leading national and international organizations, particularly the World Health Organization (WHO), obesity prevention policies have been slow and unevenly implemented. This is due to the intricacy of the obesity challenge itself. The Lancet Commission on obesity coined the term 'policy inertia' to describe the uneven implementation of commonly agreed and evidence-based policies. Syndemic thinking necessitates systems thinking to comprehend the drivers of obesity and identify promising and influential interventions [38]. Interventions to increase diet and physical activity must take into account all the factors of environmental change, both physical and social, associated with economic development. Interventions must also be able to address the lack of policies that support successful obesity control across all sectors, including agriculture, transportation, urban planning, environment, food processing, distribution, marketing, and education. In order to effectively address the issue of obesity, it is essential to have a high level of determination and leadership on the part of central and regional government as well as the involvement of all relevant sectors and individuals [40].

1.2   Problem Identification

Programs to prevent obesity problems in Indonesia have not been implemented holistically. This is triggered by several factors, namely that among fellow stakeholders there is no common perception in addressing the problem of obesity, some even believe that obesity is not a serious problem. The availability of data that describes this problem is also not evenly distributed in all provinces, in fact, to date, there has been no government determination of The extent to which target groups are particularly susceptible to obesity is precisely determined. By considering the problems that occur, the formulation of the problem to be studied can be formulated into a question: "Is it appropriate to raise the problem of obesity as a national health problem?" Therefore, this research aims to explore respondents' opinions regarding the fact that obesity cases are increasing in Indonesia, so is this fact enough to be taken into consideration to determine obesity as a national problem? It is hoped that the results of this

study can become advocacy material for decision makers to develop a more concrete plan in an effort to overcome the widespread obesity problem that occurs in Indonesia.

2 Materials and Method

2.1 Theoretical Background

Respondents' opinions were explored through a questionnaire (filling in the questionnaire yourself independently). It is believed that this self-assessment method will obtain valid data, because the respondents are field nutrition officers who have worked in their field for more than 10 years. Apart from closed statements with options using a 5 Likert scale (Strongly agree, Agree, Neutral, Disagree and Strongly Disagree), open questions were also asked to ask for respondents' opinions about what the government should do to address this problem in the future.

Structural equation modeling is a multivariate data analysis method for analyzing complex relationships between constructs and indicators. Apart from being used for relationships between variables with a causal-predictive approach, SEM is also useful for confirming measurement models/confirmatory factor analysis [13]. In this research, structural equation modeling is used to measure how much the respondent's response is expressed through the three constructs developed in the questionnaire, where each construct will contain several indicators with 5 Likert scales in addressing the problem being studied. Meanwhile, for open answers, qualitative analysis will be carried out to see the tendency in which respondents take their stance.

2.2 Dataset Description

This research was carried out by distributing questionnaires online to as many as 200 respondents. The structure of this questionnaire is built based on three analysis factors, namely Reliability; Desirability; and feasibility. Reliability consists of three latent constructs namely the General Situation which has five indicators; Policy that has three indicators; Institutions that have four indicators; as well as an activity program that has five indicators. Desirability consists of two latent constructs, namely policies which have five indicators and activity programs which have six indicators. Meanwhile, feasibility only consists of one latent construct, namely program feasibility which has eleven indicators.

2.3 Respondent

Respondents are nutrition fieldworker throughout the Bali region who in their daily work activities deal directly with the target groups for nutrition programs in hospitals, health centers and other primary health services. Respondents were selected based on the criteria that they had worked for more than 10 years in their field of responsibility. Respondent data was collected using a questionnaire method which was sent online.

Based on the results of data recordings sent back by respondents, there were 193 respondents who met the requirements.

2.4   Data Analysis

The analysis was carried out using the structural equation model design method (SEM = structural equation model), which is a combination of two statistical methods, namely factor analysis and simultaneous equation modeling (multiple regression) [34]. The formulation of the structural equation model is carried out in two stages of analysis, namely the confirmatory factor analysis stage to determine the potential candidate indicators that represent each analysis factor, and after the three analysis factors have representatives, then all the potential candidate indicators are put together in a complete equation (full model) to determine the indicators that have the most significant contribution to the solving model in accordance with the problem formulation that has been outlined. In SEM, model fit testing is typically performed on the basis of the root mean error of approximation (RMSEA). However, current RMSEA implementations, which are biased, never reject the binary nature of a data model and almost always reject it in large samples when the data is composed of five categories. Non-biased RMSEA results in a higher rejection rate, however, it is only accurate enough when there are fewer variables and the level of difference is low. On the other hand, model fit tests conducted on the basis of SRMR yielded acceptable Type I error rates across all simulation conditions. A close fit SRMR test is also more robust than a test using unbiased RMSEA [7].

3   Results

3.1   Characteristics of Respondents

Based on the questionnaire distributed through online media, there were 197 samples that responded with the characteristics as presented in table. As presented in the table, most of the respondents (75.1%) were female with the largest age range between 46-55 years (35.8%) followed by an age range of 36-45 years (21.2%). This implies that those who are respondents are people who have at least 11 years of work experience (24.4%). Indeed, there are still more people who have worked for <11 years (63.1%), but there are also samples who have worked for more than 30 years (10.4%) and although the number is relatively small there are samples who have worked for >30 years. even >40 years old. The largest proportion of respondents (51.8%) are nutrition practitioners who work in the field at health centers, hospitals, district/city health offices and provincial health offices. The rest are those who work as Academics in the Nutrition Department of the Ministry of Health's Polytechnic of Health throughout Indonesia (24.9%) and structural officials in both the Ministry of Health and other related Ministries/Institutions (19.1%). This survey also involved researchers working at the Health Research and Development Agency and other independent research institutions, although the number was relatively small (5.2%). The complete details of the characteristics of the respondents are presented in Table 1.

Table 1. Distribution of Sample Characteristics

Characteristic	Category	f	%
Age Group (y)	<=25	31	16.1
	26 - 35	26	13.5
	26 - 45	41	21.2
	46 - 55	69	35.8
	=>56	26	13.5
Gender	Female	145	75.1
	Male	48	24.9
Field of work	Structural Officials	35	18.1
	Academics	48	24.9
	Practitioner	100	51.8
	Researcher	10	5.2
Last education	Baccalaureate	20	10.4
	Applied Bachelor	73	37.8
	Bachelor	18	9.3
	Masters or up	82	42.5
Length of Work (y)	<11	122	63.2
	11 - 20	47	24.4
	21 - 30	20	10.4
	31 - 40	3	1.6
	>40	1	.5
Total Samples		**193**	**100.0**

3.2   Structural Equation Model

From the results of the confirmatory factor analysis, there are 23 potential indicators that can be included in the structural equation model with details of 11 indicators representing the reliability factor; 7 indicators represent the desirability factor; and 5 indicators representing the feasibility factor. The structural equation model which completely involves all of these indicators is presented in Fig. 1.
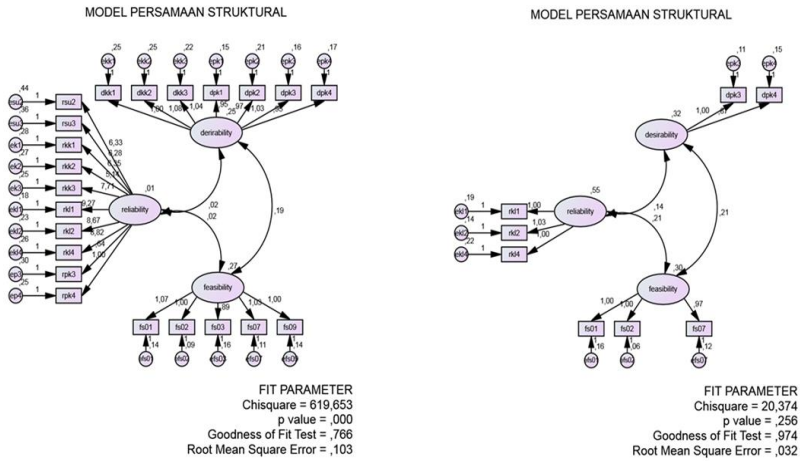
Fig. 1. Complete Structural Equation Model (Full Model)

After performing backward analysis, from the 23 potential indicators as presented in Fig. 1 on the left, a structural equation model was obtained that met all the requirements for model fit, namely p value = 0.256; GFI=0.974; and RMSEA=0.032 which leaves only 8 indicators as presented in Fig. 1 on the right.

From the analysis of the structural equation model that was carried out, it was revealed that the majority of respondents (77.7%) agreed that obesity is a serious health problem both at the central and regional levels (reliability factor). This is supported by integrated programs in many government sectors (46.1%), one of which is the prevention and control of obesity (the desirability factor). And it was reinforced by the opinion of almost half of the respondents (47.2%) who saw the need for setting national performance targets for obesity prevention in all relevant government agencies (feasibility factor)

4   Discussion

Most respondents agree that obesity is a national problem. This is supported by a fact sheet released by WHO which states that in 2016 alone, around 39% of adults 18 years and over worldwide were found to be overweight. Of these, a third are obese. As for children and adolescents aged 5-19 years, it is estimated that more than 340 million children and adolescents are overweight or obese [42]. Even though it has long been known that obesity is not a terminal problem, this is based on clinical problems and the impact of obesity is increasingly worrying about the emergence of complications of various diseases. Obesity is closely related to changes in the lipid profile, thereby increasing the risk of heart and blood vessel disease [35]. Obesity is suspected as a trigger for various types of cancer, and is even thought to be the second leading cause of cancer after smoking [31]. The rise in obesity can also lead to higher risks of reproductive issues. Reproductive issues include irregular periods, pregnancy problems, and anovulatory infertility in women, and low testosterone and low sperm

count in men [20]. In addition, obesity has a very detrimental long-term impact on the state and society. Besides having an impact on the emergence of various degenerative diseases or non-communicable diseases, obesity also has social, psychological and economic impacts on society. Therefore, if not handled properly, this problem will greatly burden the country's health costs [2].

From the aspect of governance, establishing obesity as a health problem will also be the key to successful advocacy for health development, especially at the local government level. In the era of regional autonomy, most of the policies implemented were decentralized. Unfortunately, disparities in regional potential in Indonesia are still high, so many programs fail to be implemented, not because the programs are bad, but because there is no political support, bad governance, and a lack of resources at the regional level. As the world continues to experience significant changes, many of the major societal issues need for scientific research to identify and address these issues. Despite this, management scholars are often unable to provide tangible solutions or articulate how their research will contribute to the resolution of these major societal issues [44]. However, no matter how tough the advocacy team that will be formed will not produce optimal results without the support of the availability of adequate data and information on the problems to be addressed. Therein lies the importance of the proposed determination of the magnitude of the obesity problem as one of the national health indicators.

However, it must be realized that determining indicators for national health problems is not as simple as one might imagine. There are so many indicators currently available. Some of them even overlap with one another. There are so many , officers in the field feel burdened in collecting data. Some of them cannot even collect data so that the problem cannot be properly monitored. Case studies conducted at the South Krembangan Health Center, Surabaya found there is threat discretion in implementing health policies because excess burden Work in do obligation service health [28]. Corresponding results were also found in observing the performance of public health workers in Brazil [29]. Therefore, it is necessary to evaluate the magnitude of the obesity problem by considering the characteristics of the region, making comparisons with similar problems in other countries to find conformity with internationally accepted standards of problems. WHO has determined 6 factors that need to be considered to monitor health problems which are represented by the PROGRESS acronym, namely Place=Place, Race=ethnicity, Occupation=Work, Equal Gender, Religion=Religion, Education=Education, Socioeconomic Status, and Social Resources . Therefore, the conditions for establishing indicators include that they can be disaggregated geographically at various levels (regional, national, local) and based on different subpopulations (age, sex, socioeconomic status, ethnicity, etc.). It is sensitive to changes from time to time, and is a necessary attribute [43]. If all of this is well structured, then the magnitude of the obesity problem can only be proposed as one of the national health indicators.

If it has been established as a national health problem, efforts to prevent and control obesity as one of the targets for achieving development in the health sector also face problems that are not simple. As a specific program with a broad spectrum of target groups ranging from children to adults, the success of a program to prevent and

control childhood obesity cannot stand alone, but also depends on efforts to address other health problems that touch directly or indirectly with the problem. obesity. Nutritional problems, including obesity, are complex and interrelated problems throughout the human life cycle. The problem of obesity has the potential to even occur since the baby is still in the womb [15].

If you are born with a low quality of 1000 HPK, there will be two possibilities, namely the baby will not be able to survive or if it survives, the fetus will make an adjustment reaction [19]. It is this adjustment reaction that triggers their growth and development process to be not optimal. Based on an evaluation of more than 200 babies born with very low birth weight (BBLSR), symptoms of metabolic syndrome have even been observed since they were two years old [14]. Not to mention that since birth they have been faced with the first obesogenic environment, namely the incessant promotion of infant formula as evidenced by the low coverage of exclusive breastfeeding [5]. Whereas preventing obesity should start from the breastfeeding phase. Infant nutrition does not only affect short-term health but also continues into their teenage years and into adulthood [18]. Exclusive breastfeeding will help protect babies from obesity and overweight. The more exclusive and long the baby is breast-fed, the greater the protective factors for overweight and obesity are obtained [37].

If in infancy the obesogenic environment is only limited to formula feeding, then in child the obesogenic environment begins to be complex, because physically toddlers have to deal with an environment that facilitates them to become fat [4]. The need for land due to economic pressures is increasingly urgent for marginal urbanites so that they are forced to live in slums with narrow space for movement. So it is not surprising that in the recent era there has been an increase in cases of obesity in the lower economic segment (which experts call Low Obesity) because they are conditioned by an increase in environmental toxicity, especially in urban areas which triggers an increase in obesity cases in lower middle income groups [39]. Entering school age, the obesogenic environment that facilitates individuals to become obese is increasingly widespread. The school period is the period when children begin to be active outside the home. This also means that they are getting to know food habits outside the home. This situation encourages the rapid development of franchises, especially in the food and beverage sector in Indonesia. But unfortunately, the development of this fantastic franchise has become unfavorable for the development of Indonesian children [1]. More than 50 percent of foreign franchises that have come to the Indonesian market generally carry food and beverage products that are not necessarily in accordance with the principles of balanced nutrition needed by Indonesian children.

The risk of obesity will increase again in adolescence. Adolescence is a period of searching for identity. But instead of channeling it by doing physical activities that are draining, most teenagers are looking for identity by surfing in cyberspace that doesn't require a lot of physical movement. Besides changing lifestyles, internet facilities also present things that are addictive in nature, have no educational value, and even have a negative impact on adolescent development. The results of a study conducted on more than 337 adolescents in the SMA X Bogor revealed the fact that those with a high frequency of internet use had a higher tendency for premarital sexual behavior than the group with low frequency of internet use. The result is predictable, as many as one percent of female adolescents and six percent of male adolescents stated that they had

had sexual intercourse before marriage which led to the risk of unwanted pregnancies (UWP) [11]. At this point, the problems that occurred returned to the initial stage. Unwanted pregnancies (UWP) are a crucial problem in adolescent groups and are the strongest predictor of LBW events which are the source of all these problems. A case-control study of 420 pregnant women in Colombia concluded that the absence of social support during pregnancy would increase the risk of babies born with low birth weight almost five times (OR = 4.59 ; 95% CI , 2.27–9.27; p < 0.01) [30].

So instead of raising the problem of obesity as a national problem, it would be more effective if a composite index was designed that describes the success of development in the field of nutrition by including the problem of obesity as one of its constituent elements. It has become a general awareness that there are many socio-economic phenomena that cannot be measured by a single descriptive indicator, but must be represented through a multi-aspect approach. The phenomena of development, poverty, social inequality, welfare, quality of life, and many more require a 'combination' of measurements from different dimensions. The mathematical combination (or aggregation of the problems that occur) from a set of indicators that represent different dimensions of a phenomenon to be measured can establish a composite indicator or composite index [25]. The existence of the Nutrition Development Index (IPG) is very necessary to map the distribution of nutritional problems in an area with a simple approach (only represented by a single indicator). In fact, the method for identifying problems by referring to a single indicator has been developed by WHO since 2008. The development of the Nutrition Landscape Information System (NLiS) at that time was designed to see the readiness of countries to accelerate action on efforts to improve nutrition. As time goes by, NLiS continues to evolve and be updated to include other relevant indicators [41]. The results of a study on the Sustainable Urban Development Index conducted in Pakistan also concluded that the composite index is indeed useful for evaluating program sustainability in developing country cities, especially in terms of better resource management practices [12].

5   Conclusion

When viewed from the spectrum of the problem and the magnitude of the impact it causes, the obesity problem deserves to be declared a national problem. However, in view of the complexity of the problem, it is necessary to consider the logical consequences of this determination, so that indicators of the problem of obesity can truly be used to assess the success of development programs in the field of nutrition and not just to decorate statistical reports.

It is essential for all stakeholders to recognize that the identification of indicators of national health issues is not as straightforward as it may appear. Currently, there are a variety of national health indicators available, some of which overlap with one another. As a result, many fieldworkers become confused and feel burdened in collecting data. Therefore, in order to identify the obesity issue as a national health issue, a team is necessary that can coordinate all relevant stakeholders to assess the size of the obesity issue by taking into account regional characteristics, comparing similar issues in other countries to determine compliance with internationally applicable

problem criteria. If all of these elements are well-structured, then the size of the new obesity issue can be proposed to be a national health indicator.

Nutritional issues, including obesity, are complicated issues and are connected to each other. Programs to prevent and fight obesity can't work on their own, but they also need to be successful in tackling problems that are directly or indirectly related to obesity. So, instead of defining obesity as a "national health problem", it would be better to create an index that talks about how successful nutritional development is in a certain region. You need an NDI (Nutrition Development Index) to map out the distribution of different nutritional issues (including the obesity sub-indicator) in a given region using a straightforward approach and represented by a single indicator.

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