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Commuting Patterns and Health Problems of Commuters in Regional Tourist Destination *(Case Study in Denpasar Greater Area)*

Pola Commuting dan Masalah Kesehatan Komuter di Daerah Wisata (Studi Kasus di Wilayah Denpasar)

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ABSTRACT
Commuting has become a global phenomenon in various metropolitan cities in the world, including Denpasar. Denpasar is the center of tourist destinations for Indonesian and foreign tourists. This condition makes Denpasar as a business and economic center for residents in the surrounding area. Conditions have encouraged an increasing number of commuter workers in Denpasar from sub-urban areas. The people are facing several problems such as traffic, air, noise, thermal pollution, and long duration of commuting. This study aims to analyze the relationship between commuting patterns and health problems among workers in Denpasar metropolitan areas in Indonesia. This study analyzed by using secondary data of the Sarbagita (Denpasar, Badung, Gianyar, and Tabanan) Commuter Survey 2015 from CBS Indonesia. Sample study: commuter workers aged 15-65 years with inclusion criteria are commuters passive commuting with all type transportation except bicycles/walking. Sampling method used two stages cluster sampling. The final sample was 652 persons. Statistical analysis used binary logistic regression. The study show that around one-third of commuters have commuting-related health problems. Health problems are more perceived by formal workers, low incomes, and low-educated. This study shows that distance and transportation mode had correlated with health problems (OR=1.71). Motorcycle and private car users have more health problems than public transportation (OR=2.49; OR=3.13). The impact of commuting for com-muter health can be minimized by providing a public transportation that is fast, safe, comfortable, and inexpensive. Local government must encourage the use of public transportation for commuters through campaigns from a public health perspective.

ABSTRAK
Commuting (nglaju) menjadi fenomena global di kota-kota metropolitan dunia termasuk Denpasar. Denpasar menjadi tujuan turis baik lokal maupun luar negeri. Kondisi ini menjadikan Denpasar sebagai pusat ekonomi dan bisnis bagi masyarakat yang bertempat tinggal di wilayah sekitarnya. Hal ini mendorong meningkatnya pekerja komuter dari wilayah sub-urban. Pekerja komuter berhadapan dengan banyak masalah, seperti kemacetan, polusi udara, suara dan panas serta lamanya perjalanan. Studi bertujuan mengetahui hubungan antara pola commuting dengan masalah kesehatan pada pekerja yang melakukan commuting di wilayah Denpasar dan sekitarnya. Studi menggunakan data sekunder BPS dari "Survei Komuter Sarbagita (Denpasar, Badung, Gianyar and Tabanan)" Tahun 2015. Sampel studi adalah komuter/penglaju dengan tujuan bekerja usia 15-65 tahun dengan kriteria inklusi adalah pekerja komuter yang menggunakan moda transportasi kecuali sepeda. Desain sampling menggunakan sampling kluster dua tahap. Jumlah sampel 652 orang. Analisis menggunakan multiple regresi logistik. Sebanyak dua pertiga komuter memiliki masalah kesehatan dalam commuting. Hal ini dirasakan oleh mereka yang bekerja di sektor formal, berpendidikan rendah dan berpendapatan rendah. Studi ini membuktikan jarak

dan moda transportasi berkaitan dengan masalah Kesehatan (OR=1.71). Pengguna motor dan mobil pribadi lebih banyak memiliki masalah kesehatan dibandingkan pengguna tranpsortasi publik (OR=2.49; OR=3.13). Studi ini membuktikan pola commuting berkaitan dengan masalah kesehatan di area Denpasar. Dampak commuting terhadap kesehatan komuter dapat diminimalisir dengan penyediaan transportasi publik yang cepat, aman, nyaman, dan murah terutama bagi komuter dengan jarak yang jauh. Pemerintah daerah juga harus mendorong penggunaan transportasi publik lewat kampanye berperspektif kesehatan masyarakat.

INTRODUCTION

Commuting has become a global phenomenon in various metropolitan cities in the world, including Denpasar. Denpasar is the center of tourist destinations for Indonesian and foreign tourists. Denpasar is the center of tourist destinations for Indonesian and foreign tourists. This condition makes Denpasar as a business and economic center for residents in the surrounding area. Conditions have encouraged an increasing number of commuter workers in Denpasar from sub-urban areas, namely Badung, Gianyar, and Tambanan.

Commuters facing several problems such as traffic, air, noise, thermal pollution, long duration of commuting, and also poor transportation system become a problem. According to BPS Survey in 2011-2014, some commuters spent more than 60 minutes (21%) or even did more than 120 minutes (4%) on a single trip. The majority of them used private vehicles (79%), the rest used shared transport (5%), public transport (6%), and only 1% went by feet.[1]

Commuting is conducting for work purposes becomes an important component to consider due to the long term affected on physical and mental health or psychological health problems.[2-5] Commuting can also increase blood pressure, musculoskeletal disorders, anxiety, low tolerance, bad mood.[3] The commu-ters experience stress exposure, therefore increasing negative mood causing anxiety, low tolerance, bad mood, frustration, impatience in driving cause, and unhappiness.[2-3,5-6] Besides that, long commuting also had an impact on the social aspect, i.e., social capital. Commuting has limited individual's leisure time for recreational and social activities, and create negative externalities in society by reducing participatory activities.[7,8]

Commuting time effects on health status is also dependent on the mode of transportation. There are different level of anxiety in commuting time by using various modes of transportation.[6,9,10,11] Car vehicles user are has lower satisfaction and lower health problems, and higher BMI (Body Mass Index) compared to public transport users.[8]

Currently, research on population mobility in Indonesia is still a part of population studies. Not many studies have analyzed the impact of population mobility in metropolitan areas, one of which is Sarbagita (Denpasar, Badung, Gianyar and Tabanan) from a public health perspective. Meanwhile, the problems of mobility

and health have been widely studied in metropolitan cities such as China,[11] London,[12] Inggris, USA dan Britania Raya.[13-17] This study is a current and important issue in the field of public health, especially in Indonesia urban areas. This study examines the commuting situation of workers in relation to their health. The findings of this study are expected to provide information that public health must be considered in urban development planning including the public transportation system. This study aims to analyze the relationship between commuting patterns and health problems among workers in Denpasar metropolitan areas in Indonesia.

MATERIAL AND METHODS

The study design used a cross sectional using secondary data of the *Sarbagita (Denpasar, Badung, Gianyar, and Tabanan) Commuter Survey 2015* from CBS (Central Bureau of Statistics) Indonesia. The sample study was commuter workers aged 15-65 years with exclusion criteria are commuters by active commuting. The final sample was 652 persons. This survey is a population-based survey using a two-stage probability sampling design.

The dependent variable is a health problem that covers physical, mental/psychological, and social aspects. Independent variables are socio demography, family situation, and commuting patterns. The commuting pattern consists of distance (km), frequency of commuting in a week, number of modes used besides the main mode, transportation cost, commuting time and mode of transportation. Statistical analysis binary logistic regression modeling was used to determine possible associations between the commuting pattern and health problems. Odds ratios with 95% confidence intervals (CI) was estimated from the models. This study uses data from the Sarbagita Commuter Survey from CBS with a license number: 25/LADU/08/2016, dated 10 August 2016.

RESULTS

The majority of commuters are male and 34 years old. More than a third of them are highly educated, and most work in the formal sector, with an average income of 2.5 million rupiahs per month. Most commuters are married and reside with more than two people of productive age. As many as 40% live with the elderly or toddlers. More than half of the commuters are primary wage earners and 40% secondary wage earners (Table 1).

Based on Table 2, most of them commute every day with a distance of more than 20 km and use a motorcycle/private car, only1% use public transport. Commuters as much as 22% travel more than 60 minutes one way, and 36% spend transportation costs above 10% of their total income. In the past month, most commuters experienced physical complaints such as headaches, cough/cold, and sore throat, etc. They had also experienced stress and accidents, respectively 28% and 22%. Furthermore, they were not involved in social and leisure activities (29% vs. 35%). As many as 28% of commuters had health problems in the high group, which is more than five complaints (Table 3).

Based on Table 4, female commuters had more health problems than males. Less educated

commuters had more health problems than are highly educated. Those who work in the formal sector experience had more health problems than work in the informal sector.

Table 1. Characteristics Sociodemographic

Characteristics	n = 652	%
Age (Years)		
15-20	234	35.9
21-30	183	28.1
31-40	164	25.2
41-50	67	10.3
51-65	3	0.6
Median (Years)	-	34.0
Standard deviation (Years)	-	10.8
Education		
≤ Junior high school	79	12.1
Senior high school	327	50.2
University	246	37.7
Type of worker		
Non formal	34	5.2
Formal	618	94.8
Income (Rupiah/ Months)		
< 2,500,000	289	44.3
2,500,000-5,000,000	311	47.7
5,000,001-7,500,000	21	3.2
> 7,500,000	31	4.8
Median (rupiah)	-	2,500,000
Standard deviation (rupiah)	-	2,543,774
Marital Status		
Single	170	26.1
Married	472	72.4
Widowed/divorce	10	1.5
Living with Dependent Persons	245	37.6
No. of HH Members Productive Age		
1-2 persons	206	31.6
3-4 persons	328	50.3
> 4 persons	118	18.1
Primary Wage Earner	343	52.6
Secondary Wage Earner	249	38.2

Source: Secondary Data of the Sarbagita Commuter Survey, 2015

Table 2. Commuting Pattern

Commuting Pattern	n = 652	%
Distance (Km)		
< 30	506	77.6
30-60	139	21.3
> 60	7	1.1
Median (Km)	-	18.5
Standard deviation (Km)	-	12.6
Duration (Minutes)		
< 60	511	78.4
≥ 60	141	21.6
Median (Minutes)	-	32.5
Standard deviation (Minutes)	-	21.0
Main Mode of Transportation		
Motorcycle/Private cars	645	99.0
Public transport	7	1.0
Commuting Frequency		
< 5 days/week	27	4.1
≥ 5 days/week	625	95.9
No. of Modes of Transportation Used Commuter		
One mode	645	98.9
> One mode	7	1.1
Cost of Transportation per Month		
< 10%	420	64.4
≥ 10%	232	35.6
Median	-	8.0
Standard deviation	-	8.6

Source: Secondary Data of the Sarbagita Commuter Survey, 2015

Commuters with a commuting distance of more than 30 km and a duration of more than 60 minutes at a time experienced more health problems than the other groups with AOR=1.71 and 1.53. Commuters using motorbikes and private cars had more health problems than public transport users, with AORs of 2.49 and 3.13, respectively.

DISCUSSION

The findings of this study show that around one-third of commuters had commuting-related health problems.

Health problems are more perceived by formal workers, low incomes, and the cost of transportation more than 10 percent of the incomes. This is in line with previous studies that the impact of commuting correlated with commuting costs perceived by commuters. Studies in the United States in 2008 found that poor workers spend a much larger share of their income in commuting than other workers.[15] According to World Bank standards, the maximum transportation cost is 10% of income per month. When compared with other countries such as China, only 7%, even Singapore, only about 3% of monthly income.[16]

Most commuters in Denpasar used motorbikes or private cars to work; only 1% use public transportation. Commuting patterns in Denpasar area are related to health problems, especially distance and transportation mode. Commuters traveling more than 30 km had more health problems than those less than 30 km. But this result is contrary to the duration of the commuting. Most commuters in Denpasar use motorbikes or private cars to work; only 1% use public transportation. In this study, quite a lot of commuters choose motorcycles as a mode of transportation, whereas having a high risk compared to other modes, especially if the duration of commuting longer.[17] Motorcycles were chosen by commuters because of speed reasons, and they arrived faster at work. In addition, motor transportation costs are considered cheaper than other transportation. Although the risk of a motorcycle accident is higher than in other modes.[18]

This study shows that transportation modes are related to health. Motorcycle and private car users had more health problems than public transportation. The findings of the study support previous studies.[4] The commuter switch from using private cars and motorcycles to public transport provides health benefits that are equivalent to active commuting (walking or cycling). This is a potential factor in increasing energy expenditure and decreasing body fat because commuters perform physical activities by walking towards/from public transport transit.[5,16] Besides, public transportation users had lower stress levels compared to private car users.[8] Moreover, commuters have time to relax as reading, listening music, and socializing.

Table 3. Health Problems Among Commuters

Health Problems	n	%
Health Problems		
Fever	137	21.0
Cough/cold	239	36.7
Headache	224	34.4
Sore throat	97	14.9
Sore eyes	39	6.0
Shortness of breath/ asthma	21	3.2
Colds	280	42.9
Musculoskeletal disorders	340	52.1
Stress	185	28.3
Accident	140	21.5
Crime	8	1.2
Sexual harassment	2	0.3
Not involve in social activities	190	29.1
Not do leisure activities	227	34.8
Health Problems Level		
Low (< 5 complaints)	468	71.8
High (≥ 5 complaints)	184	28.2

Source: Secondary Data of the Sarbagita Commuter Survey, 2015

Table 4. Relationship Commuting Patterns with Commuter's Health Problems

Variable	Health Problems		Crude OR (COR)	Adjusted OR (AOR)
	Low	High		
Age (Years)				
15-29	164 (70.1%)	70 (29.9%)	1.12 (0.75 – 1.66)	1.14 (0.64 – 2.02)
30-39	134 (73.2%)	49 (26.8%)	0.96 (0.62 – 1.48)	0.98 (0.59 – 1.61)
> 40	170 (72.3%)	65 (27.7%)	Ref	Ref
Sex				
Male	319 (72.3%)	122 (27.7%)	1.09 (0.76 – 1.56)	1.27 (0.84 – 1.93)
Female	149 (70.6%)	62 (29.4%)		
Education Level				
≤ Junior high school	48 (60.8%)	31 (39.2%)	2.00 (1.17 – 3.43)*	2.29(1.24 – 4.25)*
Senior high school	234 (71.6%)	93 (28.4%)	1.23 (0.84 – 1.79)	1.22 (0.80 – 1.87)
University	186 (75.6%)	60 (24.4%)	Ref	Ref
Type of Worker				
Non-Formal	27 (79.4%)	7 (20.6%)		
Formal	441 (71.4%)	177 (28.6%)	1.55 (0.66 – 3.62)	2.03 (0.79 – 5.22)
Income (Rupiah/Month)				
< 2,500,000	202 (69.9%)	87 (30.1%)		
≥ 2,500,000	266 (73.3%)	97 (26.7%)	0.85 (0.60 – 1.19)	1.05 (0.66 – 1.67)
Marital Status				
Single	120 (70.6%)	50 (29.4%)		
Married/ Widowed	348 (72.2%)	134 (27.8%)	0.92 (0.63 – 1.36)	0.91 (052 – 1.59)
Living with Dependent Persons				
No	292 (71.7%)	115 (28.3%)		
Yes	176 (71.8%)	69 (28.2%)	0.99 (0.70 – 1.42)	1.02 (0.68 – 1.53)
No. of HH Members Productive Age				
1-2 persons	150 (72.8%)	56 (27.2%)		
> 3 persons	318 (71.3%)	128 (28.7%)	1.08 (0.74 – 1.56)	1. 09 (0.70 – 1.71)
Primary Wage Earner				
No	223 (72.2%)	86 (27.8%)		
Yes	245 (71.4%)	98 (28.6%)	1.04 (0.74 – 1.46)	1.07 (0.69 – 1.67)
Secondary Wage Earner				
No	282 (70.0%)	121 (30.0%)		
Yes	186 (74.7%)	63 (25.3%)	0,79 (0.55 – 1.13)	0.81 (0.53 – 1.22)
Distance				
< 30 km	383 (75.7%)	123 (24.3%)		
≥ 30 km	85 (58.2%)	61 (41.8%)	2.23 (1.52 – 3.29)*	1.71 (1.06 – 2.77)*
Duration (One way)				
< 60 minutes	383 (75.0%)	128 (25.0%)	1.97 (1.33 – 2.92)*	1.53 (0.94 – 2.49)
≥ 60 minutes	85 (60.3%)	56 (39.7%)		
Frequency of Commute				
< 5 days/week	19 (70.4%)	8 (29.6%)	0.93 (0.40 – 2.17)	0.80 (0.32 – 2.02)
≥ 5 days/week	449 (71.8%)	176 (28.2)		
Main Mode of Transportation				
Motorcycle	432 (72.0%)	168 (28.0%)	1.56 (0.17 – 14.02)	2.49 (0.25 – 24.59)
Private car	32 (68.1%)	15 (31.9%)	1.87 (0.19 – 18.25)	3.13 (0.29 – 33.85)
Public transport	4 (80.0%)	1 (20.0%)	Ref	Ref
Proportion of Transport Cost per Income				
< 10%	316 (75.2%)	104 (24.8%)		
≥ 10%	152 (65.5%)	80 (34.5%)	1.59 (1.13 – 2.27)*	1.16 (0.73 – 1.85)

Source: Secondary Data of the Sarbagita Commuter Survey, 2015

*significant at 5%

According to Putrawan & Sari, the high mobility of workers in Denpasar is not supported by the provision of public transpor-tation. Only 1,93% of workers use public transportation from the residence to the workplace. Almost all (95.71%) workers choose to use private transportation over public or shared transportation.[20] To encourage the use of public transportation, in 2011 the Regional Government developed the BRT known as Trans Sarbagita. Trans Sarbagita is one program that aims to help people to switch to using public transportation.

This program is carried out to overcome congestion and the response of the provincial government to the problem of the lack of public transportation in Bali. However, since it began operating in 2011, this program has not been able to be received by the community in Denpasar and surrounding areas.[20] This needs a study to find out why the use of public transportation in Denpasar and surrounding areas remains low.

This study had many strengths and limitations; there are: *first*, this study uses survey data collected by CBS-Indonesia. This survey is population-based with a fairly large sample size with a probability random sampling method. This survey does not aim to analyze the relation between commuting and health problems; obviously, the health problems in this study used only the available variables. So, the validity of the measurement of health outcomes that include physical, psychological, and social are minimal. *Second*, the analysis of this study has considered some potential confounder variables from the data. Still, other variables that substantially act as confounder are not available such as commuter compensation (job satisfaction and housing quality), gender roles in households, and contextual variables (such as traffic jam level and public transportation system). *Third*, the study used a cross-sectional design, so the researcher cannot conclude that commuting has a causal effect on health, there may be other causes of health and daily life of commuters that affect commuting. *Fourth*, there is a threat of bias in this study, i.e., the healthy commuter effect where the only healthy commuters can survive in commuting. Healthy commuters tend to continue long-term commuting, whereas in those who feel health problems will choose to reduce the duration or distance of commuting or change the mode of transportation to minimize the pressure of commuting. Finally, the estimated duration of commuting is influenced by respondent mood; those with a negative mood are more likely to respond to excessive commuting time. This condition has an impact on misclassifications that tend to increase the estimate of commuting associations with health outcomes.

Although this study has its limitations, the researcher believes if this study has an important contribution to understanding the factors determinants health problems among commuter workers, especially in the metropolitan area in Indonesia. This study also encourages further studies of the benefits of public transportation from a public health perspective, especially in metropolitan areas in Indonesia.

CONCLUSION AND RECOMMENDATION

These findings indicate that commuting patterns related to commuters' health problems especially commuting distance. Commuting with a long-distance (OR=0.71) and motorcycle or private car users had a greater risk of health problems than other groups (OR=2.49; OR=3.13). These findings are in line with previous studies in many countries. To minimize the impact of commuting on health, commuters should use public transportation, especially commuters with long distances. The level of fatigue using a private car or motorcycle is higher when traveling long distances. On the other hand, the government must ensure the availability of public transportation that is fast, comfortable, safe, and affordable for commuters. In addition, it is necessary to campaign for the benefits of using public transportation from a public health perspective.

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