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Double Burden of Persons with Disabilities: Are Those More Likely to Suffer from Chronic Disease?

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Double Burden of Persons with Disabilities: Are Those More Likely to Suffer from Chronic Disease?

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Abstract

This study examines the likelihood of persons with disabilities experiencing chronic diseases compared to those without disabilities, emphasizing the role of demographic characteristics. Prior research shows that individuals with disabilities have a higher risk of chronic diseases due to pre-existing health conditions, secondary complications, healthcare access barriers, and limited health education. Beyond these factors, we argue that demographic characteristics—such as age, gender, insurance status, and living environment—also shape daily habits and lifestyles that influence long-term health outcomes. Using probit regression analysis, this study quantifies the probability of chronic disease among persons with disabilities. Our findings indicate that individuals with disabilities who are female, uninsured, unhappy, reside in urban areas, are of productive age, and live in larger households face a higher likelihood of chronic diseases. Compared to their rural and non-productive-age counterparts, they may encounter more significant stressors, unhealthy lifestyle patterns, and limited preventive healthcare. These results highlight the need for targeted health interventions that address both structural and demographic factors to reduce chronic disease risks among persons with disabilities.

Keywords : Persons with disabilities, chronic disease, double burden, probit regression

Abstrak

Studi ini meneliti kemungkinan individu dengan disabilitas mengalami penyakit kronis dibandingkan dengan mereka yang tidak memiliki disabilitas, dengan menekankan peran karakteristik demografis. Penelitian sebelumnya menunjukkan bahwa individu dengan disabilitas memiliki risiko lebih tinggi terhadap penyakit kronis akibat kondisi kesehatan yang sudah ada sebelumnya, komplikasi sekunder, hambatan dalam akses layanan kesehatan, dan keterbatasan edukasi kesehatan. Selain faktor-faktor tersebut, studi ini berargumen bahwa karakteristik demografis—seperti usia, jenis kelamin, status asuransi, dan lingkungan tempat tinggal—juga berperan dalam membentuk kebiasaan sehari-hari dan gaya hidup yang dapat memengaruhi kondisi kesehatan jangka panjang. Menggunakan analisis regresi probit, penelitian ini mengukur probabilitas penyakit kronis pada penyandang disabilitas. Hasil penelitian ini menunjukkan bahwa individu dengan disabilitas yang berjenis kelamin perempuan, tidak memiliki asuransi kesehatan, merasa tidak bahagia,

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tinggal di daerah perkotaan, berada dalam usia produktif, dan hidup dalam rumah tangga dengan jumlah anggota lebih dari empat memiliki kemungkinan lebih tinggi mengalami penyakit kronis. Dibandingkan dengan mereka yang tinggal di pedesaan atau berada dalam kelompok usia nonproduktif, kelompok ini cenderung menghadapi lebih banyak stres, memiliki pola hidup yang kurang sehat, serta mengalami keterbatasan dalam akses layanan kesehatan preventif. Temuan ini menegaskan pentingnya intervensi kesehatan yang mempertimbangkan hambatan struktural serta faktor demografis guna mengurangi risiko penyakit kronis pada penyandang disabilitas.

Kata kunci : Penyandang disabilitas, penyakit kronis, beban ganda, regresi probit

INTRODUCTION

Chronic diseases—including heart disease, stroke, chronic respiratory diseases, cancer, and diabetes—are major public health concerns, causing significant morbidity and mortality worldwide (WHO, 2018). While these conditions can affect anyone, research indicates that persons with disabilities face a disproportionately higher risk of developing chronic conditions compared to non-persons with disabilities due to multiple factors, including secondary health complications, environmental barriers, and disparities in healthcare access (Krahn et al., 2015; WHO, 2011). Persons with disabilities and chronic diseases often experience additional challenges, such as higher healthcare costs, limited availability of disability-inclusive health services, and insufficient preventive care (Iezzoni, 2011). Furthermore, the lack of accessible health education tailored to the needs of persons with disabilities exacerbates these risks (Mitra et al., 2017).

Several studies confirm that persons with disabilities have a higher risk of developing chronic diseases compared to those without disabilities. Research by Xu, Y., Morales, M.A., Magaña, S., et al. (2024) indicates that adults with intellectual and developmental disabilities are particularly susceptible to chronic conditions such as heart disease and diabetes. This heightened risk can be attributed to

various factors, including pre-existing health conditions that may worsen over time due to inadequate healthcare access and delayed diagnosis. Delayed diagnosis is often caused by insufficient awareness of health issues among persons with disabilities, disparities in access to health facilities, and inadequate healthcare infrastructure. Health services are currently considered suboptimal, particularly for persons with disabilities. While general community health services already face challenges, the situation is even worse for persons with disabilities due to the lack of tailored healthcare responses. Many health facilities lack a Standard Operating Procedure (SOP) designed for persons with disabilities, resulting in inadequate services. The absence of trained health workers highlights the lack of access to quality health services. Challenges include long travel distances to health facilities, a lack of disability-friendly infrastructure, and low health insurance coverage among persons with disabilities (Article 33 Indonesia, 2021). Research by Froehlich-Grobe et al. (2016) also indicates gaps in healthcare services between persons with and without disabilities, which remain difficult to bridge.

In addition to the previously mentioned factors, other studies have found that demographic characteristics can increase the likelihood of developing chronic diseases. These characteristics often reflect daily habits and lifestyles that influence the risk of chronic conditions. A study conducted by Takale et al. (2023) concluded that demographic factors such as gender, happiness status, insurance ownership, region of residence, age, and others could be the cause of increasing the probability of individuals having chronic diseases.

This study aims to see how vulnerable persons with disabilities are to chronic diseases in Indonesia, which can create a double burden on disability in Indonesia. Furthermore, this study also fills the gap in various previous research, which has proven that persons with disabilities have higher vulnerabilities compared to non- persons with disabilities, but has not looked in-depth at the characteristics and background of these individuals. By recognizing the impact of demographic actors, healthcare providers and policymakers can implement more targeted

strategies to mitigate the risk of chronic diseases among the persons with disabilities group.

Existing literature underscores the heightened susceptibility of persons with disabilities to chronic diseases compared to persons without disabilities. Research has consistently shown that persons with disabilities are at a higher risk of experiencing chronic conditions (van den Bemd et al. 2022; Froehlich-Grobe and Lollar 2011; Horner-Johnson et al. 2013; Kim, Jang, and Lim 2022; Krahn, Reyes, and Fox 2014; Park and Park 2023). This increased susceptibility is attributed to compromised health status, preventable secondary conditions, and disparities in healthcare access and preventive services (Abdullah et al. 2004; Ibarra and Johnson 2014; Rimmer and Rowland 2008). The presence of frailty and geriatric diseases in persons with disabilities further exacerbates the prevalence of chronic diseases as they age, making aging an important variable in studying health risks among persons with disabilities (Lim, 2022).

Studies have highlighted disparities in health outcomes between persons with disabilities and the general population, particularly in terms of chronic health conditions (Agaronnik et al. 2019; Courtney-Long et al. 2017; Guley, Rasch, and Chan 2014; Jones, Morris, and Deruyter 2018; Krahn and Fox 2014). These disparities are not limited to specific conditions but encompass a wide range of health issues, including cancer (Hughes, Robinson-Whelen, and Knudson 2022; Sakellariou and Rotarou 2020), obesity (Froehlich-Grobe and Lollar 2011), and even sexual health concerns (Rowen, Stein, and Tepper 2015). The disparities in care for persons with disabilities have been acknowledged in federal reports and academic research studies (Agaronnik et al., 2019).

Other studies show that persons with disabilities are more susceptible to chronic diseases than persons without disabilities due to the lack of focused examinations on vulnerable groups and the lack of routine health promotion programs that are held by regional health facilities targeting persons with disabilities (Ibarra and Johnson 2014). In addition, WHO (2021) states that around

15% of the world's population consists of persons with disabilities who need routine health services, which is a fairly high number. Similar to Indonesia, it is estimated that persons with disabilities reach 9% or as many as 25 million people (Martak et al. 2021) (Martak & Nurhasana 2022). This means that there is at least one person with disabilities in every ten people. This illustration highlights the importance of considering disability as a key indicator in health sector prioritization, given the increasing trend of chronic disease prevalence (Isfandari 2009). Furthermore, studies have shown that persons with disabilities are disproportionately affected by poverty, which in turn exacerbates their barriers to healthcare access (Mitra, Posarac, & Vick, 2013).

This research argues that the probability of persons with disabilities developing chronic diseases is not only due to their disability condition and gaps in healthcare access but also influenced by social and demographic characteristics. Differences in demographic characteristics reflect socially shaped daily activities, which then influence health conditions and increase the probability of having a chronic disease in the future.

THEORETICAL FRAMEWORK

Persons with disabilities, whether intellectual or physical, face a higher risk of chronic diseases due to systemic barriers to healthcare access, including inaccessible facilities, transportation difficulties, and communication challenges (van den Bemd et al., 2022; Park & Park, 2023; Todorova, 2021). These obstacles lead to delayed diagnoses and inadequate treatment, exacerbating their health conditions. Additionally, persons with disabilities are more susceptible to preventable secondary diseases, mental health issues, and lifestyle-related conditions such as obesity, which further increase the risk of diabetes, hypertension, and cardiovascular diseases (Froehlich-Grobe, Lee, & Washburn, 2013).

According to Law of the Republic of Indonesia Number 8 of 2016 on Persons with Disabilities, disabilities are classified into four categories: physical disabilities (such as mobility impairments, amputations, or paralysis), intellectual disabilities

(including developmental disorders such as Down syndrome), mental disabilities (such as schizophrenia, bipolar disorder, and other psychiatric conditions), and sensory disabilities (which include visual and hearing impairments). Each type of disability presents distinct healthcare challenges, making it essential to consider these variations when analyzing health disparities among persons with disabilities.

Beyond healthcare access, demographic factors also play a crucial role in shaping health disparities among persons with disabilities. Socioeconomic status, education, employment, and geographic location significantly impact health outcomes, with lower-income individuals experiencing more significant healthcare challenges (Iezzoni et al., 2015; Mitra et al., 2017). Limited health literacy and financial constraints often lead to poor disease management and worsened conditions (Krahn et al., 2014; Palmer et al., 2017). Despite this, research on the intersection of disability, chronic disease, and demographic characteristics remains limited, necessitating a deeper exploration of these factors.

This study applies the Double Burden Theory, which explains that persons with disabilities not only experience functional limitations but also face a higher risk of chronic diseases due to systemic barriers (Krahn et al., 2014). The Social Model of Disability further emphasizes that health outcomes for persons with disabilities are shaped by medical conditions and environmental and policy-related factors (Oliver, 1990; WHO, 2011). Additionally, research on Demographic Health Disparities highlights that age, gender, income, and geographic location contribute to variations in health risks, potentially exacerbating existing inequalities (Mitra et al., 2017).

By identifying the probability of persons with disabilities developing chronic diseases and analyzing demographic influences, this study provides evidence-based insights for policymakers. Targeted health interventions can optimize resource allocation, ensuring more inclusive healthcare policies and reducing disparities. This research contributes to a more equitable healthcare system that better addresses the needs of persons with disabilities.

RESEARCH METHODS

This study uses a quantitative approach with secondary data sourced from the Indonesian Family Life Survey (IFLS) in 2014. IFLS is a dataset collected every seven years at the individual, household, and community levels. It deals with demographic and socioeconomic issues, including health. IFLS 2014 involved 16,931 households and 50,148 people in Indonesia (Strauss, Witoelar, and Sikoki 2016). This study also sorted the data to eliminate any possible statistical error, such as missing data (although some tolerable errors might persist). It ended up with a total of 29,373 observation samples. Among all individuals selected as samples in this study, 402 people (1.37%) are persons with disabilities diagnosed by health workers.

The IFLS survey also has subsections and questions related to chronic disease¹. The question is asked: "Has a health worker ever diagnosed you with a disease (Y1)?" The questionnaire in this study only captures whether an individual has been diagnosed with a chronic disease without specifying the frequency or number of chronic diseases they have experienced. This limitation implies that while the study can identify associations between disability and the presence of chronic disease, it does not account for the severity or multiplicity of conditions. As a result, future studies could explore the burden of multiple chronic conditions among persons with disabilities to provide a more comprehensive understanding of their health status.

In determining the disability status of individuals, this study refers to IFLS questions that ask respondents whether a doctor, paramedic, nurse, or midwife has ever diagnosed them with a disability. The disabilities identified in IFLS include physical impairments (such as loss of limbs), brain injuries, visual impairments, hearing impairments, speech impairments, intellectual disabilities, and autism. To further refine the categorization, individuals were classified as having a disability if their condition significantly hindered their ability to work or perform daily activities. Those who reported minor impairments without significant functional limitations were excluded from the sample.

This study is divided into two main analytical parts. The first part is a descriptive analysis that aims to illustrate the overall condition of the sample, particularly the differences in chronic disease characteristics between persons with and without disabilities. The second part employs an empirical analysis using the Limited Dependent Variable (LDV) model with probit regression to assess whether persons with disabilities have a higher probability of suffering from chronic diseases compared to non-persons with disabilities. While various estimation techniques exist for LDV models, probit regression is chosen due to its suitability for binary dependent variables and the assumption of a normal distribution of error terms. This method is widely used in health-related research to estimate probabilities while accounting for the nonlinear relationship between explanatory variables and outcomes (Wooldridge, 2012). Additionally, sub-sample regression examines potential variations in the relationship between disability status and chronic disease probability across different groups, such as gender, place of residence (urban vs. rural), and insurance ownership. This approach allows for a more detailed understanding of heterogeneity in health disparities among persons with disabilities. Finally, we estimate the following probit regression:

$$disease_i = \beta_0 + \beta_1 disabled_i + \beta_2 Ind_i + \beta_3 HH_i + U_i \dots \dots \dots (1)$$

As mentioned, the disease is a binary dependent variable (0 = not having chronic disease; 1 = having chronic disease). Disabled refers to one's disability condition and whether one is disabled. In addition, Ind and HH refer to predetermined characteristics such as sex, age, insurance ownership, residence area, household number, working status, schooling participation, life satisfaction, and happiness level of respondents. Further explanation regarding dependent and independent variables is in Appendix 1. This study also uses several equations to ensure the robustness of the results, which will be shown in more detail in Appendix 2.

Because we used a probit regression model, and the coefficients from the main estimation are not directly

interpretable, we need to find the marginal effects first to interpret those coefficients. From this,

$$E(\text{disease}_i|x) = P(\text{disease}_i = 1|x) = \Phi\left(\frac{\beta_0 + \beta_1 \text{disabled}_i + \beta_2 \text{Ind}_i + \beta_3 \text{HH}_i}{\sigma}\right) \dots \dots \dots (2)$$

we need to differentiate to find the marginal effects and the interpretable coefficients:

$$\frac{dE(x)}{dx} = E(\text{disease}_i|x) = P(\text{disease}_i = 1|x) = \Phi\left(\frac{\beta_0 + \beta_1 \text{disabled}_i + \beta_2 \text{Ind}_i + \beta_3 \text{HH}_i}{\sigma}\right) \cdot \beta_i \dots \dots \dots (3)$$

Later on in the results table that could be found in the results section, to avoid confusion, this study is only include the marginal effects or the interpretable coefficients (labeled as dy/dx), which provide a direct interpretation of the likelihood of disability on the probability of having a chronic disease. This approach ensures a clearer understanding of the practical significance of disability on health status rather than just the relative odds or coefficients.

To further strengthen the analysis, we employ three models to assess the robustness of our results in determining whether disability increases an individual's likelihood of suffering from a chronic disease. To strengthen the robustness of the findings, this study utilizes three different model specifications: (1) a baseline model without control variables or fixed effects, (2) a model incorporating control variables but without fixed effects, and (3) a fully specified model with both control variables and fixed effects. The analysis incorporates fixed effects for residence area, schooling participation, and gender to control for potential confounding factors that could influence health outcomes.

Additionally, to minimize potential bias, all independent variables are included in the regression model as control variables—except for the main independent variable, disability status. This approach ensures that the estimated effect of disability on chronic disease likelihood is not confounded by other factors.

RESULT AND DISCUSSION

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1. DESCRIPTIVE ANALYSIS

Based on Table 1, of the 29,373 study samples, 402 (1.37%) are persons with disabilities, and the rest are persons who do not have disabilities.

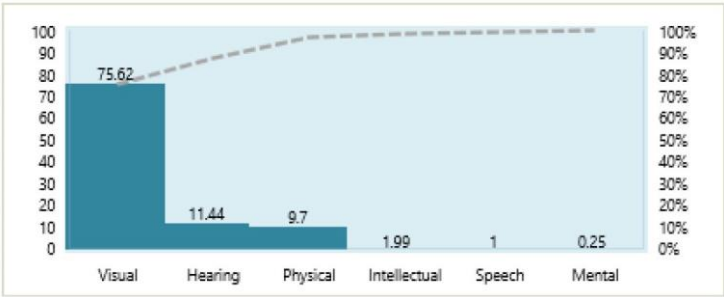
Table 1. Distribution of persons with disabilities in the sample

Category	Frequency	Percent
Disability	402	1.37%
Non-disability	28,971	98.63%
Total	29,373	100%

Source: IFLS 2014 (processed)

Persons with disabilities can be distinguished based on the type of disability. In this study, using the data available in IFLS in Figure 1, the types of disability are divided into 6 (six): 1) physical disability, 2) visual impairment, 3) hearing disability, 4) speech disability, 5) intellectual disability, and 6) mental disability. In this study, most samples had visual impairment (75.62%).

Figure 1. Type of Disability (%)

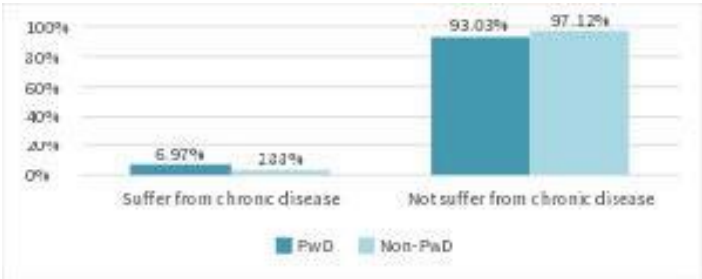


Source: IFLS 2014 (processed)

From the entire sample of persons with disabilities and without disabilities, the percentage of persons suffering from chronic diseases is higher in individuals with disabilities by 6.97%. Of individuals who do not have disabilities, only 2.88% suffer from

chronic diseases. Another fact shown by Figure 2 is that the high percentage of persons with disabilities who suffer from chronic diseases also indirectly shows that non-persons with disabilities who do not experience chronic diseases are lower than persons with disabilities.

Figure 2. Percentage of chronic diseases of persons with disabilities and non-persons with disabilities



Source: IFLS 2014 (processed)

2. EMPIRICAL ANALYSIS

A. PERSONS WITH DISABILITIES AND THEIR PROBABILITY OF SUFFERING FROM CHRONIC DISEASES

Table 2. General Probit Regression Results

VARIABLES	(1) Chronic Disease (dy/dx)	(2) Chronic Disease (dy/dx)	(3) Chronic Disease (dy/dx)
Independent variables			
Persons with Disabilities=1	0.0280*** (0.00644)	0.0219*** (0.00638)	0.0209*** (0.00639)
Control variables			
Age of Respondents		0.000798*** (6.88e-05)	0.000789*** (6.87e-05)
Sex, Male=1		-0.0102*** (0.00204)	-0.0102*** (0.00204)
Insurance Ownership, Yes=1		0.000354 (0.00199)	0.000178 (0.00200)

Residence Area, Urban=1		0.00558***	0.00335
		(0.00210)	(0.00251)
Working Status, Working=1		0.00175	0.00181
		(0.00330)	(0.00331)
Household Number		0.00155***	0.00138**
		(0.000560)	(0.000566)
(Log) Per Capita Expenditure		0.00742***	0.00619***
		(0.00166)	(0.00170)
Schooling Participation, Schooling=1		0.0111**	0.00958*
		(0.00506)	(0.00514)
Life Satisfaction, Satisfied=1		-0.00566**	-0.00518*
		(0.00287)	(0.00287)
Happiness Level, Happy=1		-0.00247	-0.00225
		(0.00349)	(0.00350)
Control variable	No	Yes	Yes
Fixed-Effect	No	No	Yes
Observations	29,373	29,367	29,349

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

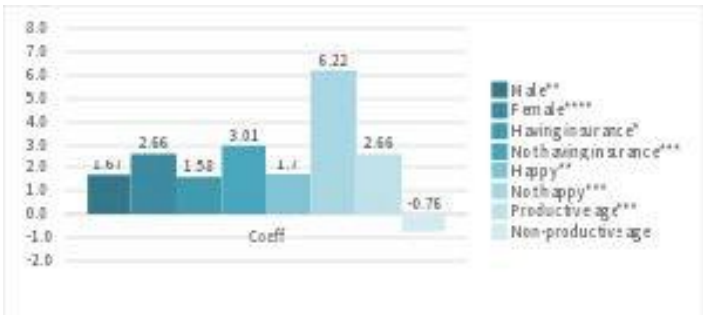
In this section, we use three models to demonstrate the robustness of the results on whether disability increases a person's chance of suffering from a chronic disease. The results of the regression analysis are consistent across all models, which is available in Table 2, indicating that a person with a disability will have a higher probability of suffering from a chronic disease by 2.09 percentage points when compared to a person without a disability. This is also consistent with another study investigating the same subject, which found that chronic disease has a significant relationship and contributes to the burden of persons with disabilities with the severe impact of the condition (van den Bemd et al. 2022; Ibarra and Johnson 2014; Klijs et al. 2011; Park and Park 2023; Picavet and Van Den Bos 1997; Todorova 2021).

People with disabilities are also 6 times more likely to have poor personal health and 9 days less healthy a month. This is possible due to people with disabilities receiving less treatment for chronic

diseases other than their physical disability and also the lack of health promotion held by health facilities at the local level that explicitly targets persons with disabilities (Froehlich-Grobe et al. 2016). Another study examined the expenditure for healthcare among persons with disabilities is likely greater than among non-persons with disabilities, indicating that persons with disabilities use more healthcare facilities to do treatment or get medicine, which can represent the likelihood of persons with disabilities having severe conditions is high (Anderson et al. 2010; Khavjou et al. 2020).

B. THE PROBABILITY OF PERSONS WITH DISABILITIES HAVING A CHRONIC DISEASE BASED ON INDIVIDUAL CHARACTERISTICS

Figure 3. Probability of Persons with Disabilities Suffering from Chronic Disease Based on Individual Characteristics (in percentage points)



Source: IFLS 2014 (processed)

Several individual characteristics further amplify this vulnerability, which is shown in Figure 3. Women with disabilities face a higher probability (2.6 percentage points) of chronic disease than men with disabilities, consistent with research indicating that biological and psychological factors contribute to gender disparities in health risks (Nusselder et al. 2019; Klijs et al. 2011). Additionally, persons with disabilities in the productive age group experience an increased probability of chronic disease by 2.66 percentage points compared to their non-disabled counterparts, highlighting the compounded risks faced

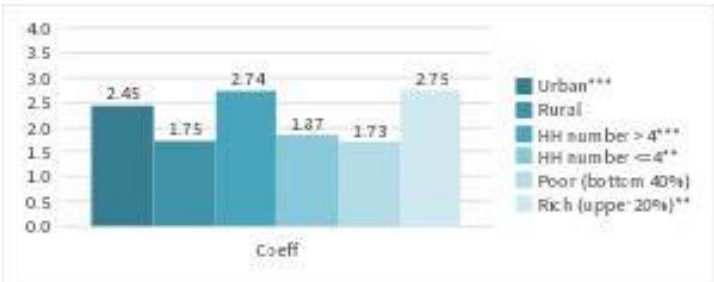
by persons with disabilities who are of working age.

Insurance ownership also plays a role in health disparities. Persons with disabilities who are uninsured are more likely to suffer from chronic diseases (3 percentage points) than those with insurance (1.6 percentage points). Although health insurance coverage, particularly through Indonesia's BPJS program, has improved access to healthcare, challenges remain in ensuring equal quality of treatment for persons with disabilities (Soltani et al. 2019). Many people with disabilities receive less treatment for chronic diseases beyond their primary disability, and there is a lack of targeted health promotion efforts by local healthcare facilities (Froehlich-Grobe et al. 2016). Additionally, studies indicate that healthcare expenditures for persons with disabilities are higher than those for non-persons with disabilities, as they require more frequent medical care and medication. This suggests a higher likelihood of severe health conditions among persons with disabilities (Anderson et al. 2010; Khavjou et al. 2020).

An intriguing aspect emerges when examining age characteristics in relation to chronic disease development. The analysis reveals that those individuals within the non-productive age bracket—comprising those below 4 years and over 65 years—exhibit a comparable likelihood of developing chronic diseases when compared to their non-persons with disabilities counterparts. This parity arises primarily due to the propensity for chronic disease prevalence to increase within older age groups, as evidenced by research findings (Froehlich-Grobe et al. 2016; Marinić and Brkljačić 2008). In contrast, disability emerges as a significant determinant for individuals within the productive age bracket incurring chronic diseases, with a notable increase of 2.66 percentage points. This disparity underscores the influence of disability on chronic disease susceptibility among individuals in their productive years. One contributing factor to this discrepancy is the limited access that persons with disabilities in the productive age group have to essential healthcare facilities. This observation underscores the importance of addressing accessibility barriers and ensuring equitable healthcare provisions for persons with

disabilities, particularly those in the productive age range. Enhancing access to appropriate healthcare resources and services can mitigate the disproportionate burden of chronic diseases experienced by this demographic segment, thus fostering greater health equity across the population.

Figure 4. Probability of Persons with Disabilities of Chronic Disease by Household Characteristics (in percentage points)



Source: IFLS 2014 (processed)

The analysis further reveals urban-rural differences in health outcomes, available in Figure 4. While persons with disabilities in rural areas do not show a significantly different probability of suffering from chronic diseases compared to their non-persons with disabilities counterparts, urban residents with disabilities have a 2.45 percentage point higher likelihood. This suggests that despite better healthcare access in cities, urban environments pose unique health risks for persons with disabilities, possibly due to lifestyle factors, environmental stressors, and accessibility barriers in healthcare facilities (Janssen et al. 2015; Bromley et al. 2016).

Household size and economic status also influence health outcomes. Persons with disabilities living in larger households (four or more members) have a higher probability of suffering from chronic diseases (1.87 percentage points), likely due to economic burdens that limit healthcare access. Surprisingly, persons with disabilities from higher socioeconomic backgrounds exhibit a higher probability (2.75 percentage points) of chronic disease compared to non-persons with disabilities in the same economic group. This aligns with findings from Bangladesh,

where wealthier households showed higher morbidity rates among persons with disabilities, possibly due to differences in healthcare-seeking behavior (Rana et al. 2024).

Overall, this study highlights that those persons with disabilities—especially those who are female, uninsured, living in urban areas, of productive age, and in larger households—face a disproportionately higher risk of chronic diseases. These findings underscore the need for targeted health interventions to reduce disparities and improve healthcare access for persons with disabilities.

CONCLUSION

This study finds that persons with disabilities have a significantly higher likelihood of suffering from chronic diseases. Using the probit model with three regression variations, the analysis confirms that disability significantly determines chronic disease risk. However, while persons with disabilities are generally more vulnerable to chronic diseases, those who are male, have insurance and report higher happiness levels are less likely to suffer from chronic diseases compared to their respective counterparts.

Household characteristics also play a role in determining the health conditions of persons with disabilities. Living in urban areas, having more household members, and having a higher level of welfare are associated with an increased probability of suffering from chronic diseases among persons with disabilities. This may be due to households with more members and more significant financial resources being more exposed to intensive activities or adopting less healthy lifestyles, which in turn increase the risk of chronic diseases. Meanwhile, among poor households, disability status remains a significant factor in determining the likelihood of chronic diseases. This suggests that health challenges for persons with disabilities are not solely influenced by economic conditions but also by intrinsic factors related to disability itself.

This study contributes to the existing literature by addressing an important research gap. While previous studies have primarily

focused on the healthcare access disparities faced by persons with disabilities and their overall vulnerability to chronic diseases, limited attention has been given to how demographic and socioeconomic factors further shape their health risks. By incorporating these factors into the analysis, this study provides a more comprehensive understanding of the determinants of chronic disease among persons with disabilities. The findings align with the Double Burden Theory and the Social Model of Disability, emphasizing that health outcomes for persons with disabilities are influenced not only by medical conditions but also by systemic and social factors. Additionally, insights from Demographic Health Disparities research highlight how age, gender, household characteristics, and economic conditions contribute to variations in chronic disease risks.

Based on these findings, this study recommends several strategic steps to reduce the double burden faced by persons with disabilities:

1. Expand health insurance coverage for persons with disabilities – The Ministry of Health should prioritize increasing insurance enrollment among persons with disabilities, as insurance ownership is linked to a lower probability of chronic diseases. This aligns with the government's *Asta Cita* vision of improving healthcare access.
2. Enhance the quality and accessibility of healthcare services – Strengthening healthcare facilities, particularly in urban areas, can be done by improving disability-inclusive services, training health workers, and ensuring the availability of essential medicines and assistive health technologies
3. Implement routine health monitoring for persons with disabilities – Establish regular health check-ups and monitoring programs for persons with disabilities and chronic diseases to ensure continuous treatment and disease control
4. Integrate disability-focused policies into national and regional health planning – Incorporate disability-sensitive approaches in health policies, including targeted prevention programs, lifestyle interventions, and further research on household dynamics that can affect persons with disabilities.

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Additionally, this study highlights the need for further research on household dynamics and lifestyle patterns in relation to the health of persons with disabilities. A deeper understanding of these factors can help design more targeted policies to improve the well-being and health of this vulnerable group.

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APPENDIXES

Appendix 1. Variables Used in the Analysis

N o	Variables	Notes	Category
1.	Disease	Dummy variable, indicates 1 = person with chronic disease; and 0 = person not having chronic disease	Dependent variable
2.	Disabled person	Dummy variable, indicates 1 = person with disability; and 0 = person without disability	Independent variable (main)
Individual characteristics			
3.	Age of respondent	The continuous variable indicates the age of respondents from 14 years old	Control variable
4.	Gender	Dummy variable, indicates 1= male; and 0 = female	Control variable
5.	Insurance ownership	Dummy variable, indicates 1 = having insurance; and 0 = not having insurance	Control variable
6.	Schooling participation	Dummy variable, indicates 1 = schooling; and 0 = not schooling	Control variable
7.	Life satisfaction	Dummy variable, indicates 1 = satisfied with life; and 0 = not satisfied with life (A Likert scale questionnaire, whereas numbers 1-3 classified as satisfied, and 4-5 classified as not satisfied)	Control variable
8.	Happiness	Dummy variable, indicates 1 = happy with life; and 0 = not happy with life (A Likert scale questionnaire, whereas numbers 1-2 classified as happy, and 3-4 classified as not happy)	Control variable
9.	Working status	Dummy variable, indicates 1 = working; and 0 = not working	Control variable
Household characteristics			
10.	Residence area	Dummy variable, indicates 1= urban; and 0 = rural	Control variable
11.	Household number	The continuous variable indicates the number of people in a household	Control variable
12.	Per capita expenditure	Continues variable, in Logarithm, indicates per capita expenditure in a household	Control variable

Appendix 2. Variables and Models Used in the Analysis

Variables	Equations (general and by the characteristic of diffable)															
	1st: General model, with and without control and FE	2nd: By Male	3rd: By Female	4th: By Urban	5th: By Rural	6th: By Having insurance	7th: By not having insurance	8th: By Productive age	9th: By Not productive age	10th: By Happiness level (Yes)	11th: By Happiness level (No)	12th: By HH number (> 4)	13th: By HH number (<= 4)	14th: by Poor	15th: by Middle rich	16th: by Rich
Disabled person (1 = yes)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual characteristics																
Age of respondent	Yes	Yes	Yes	Yes	Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes	Yes
Gender (1 = male)	Yes			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Insurance ownership (1 = yes)	Yes	Yes	Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Schooling participation (1 = yes)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Life satisfaction (1 = satisfied)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Happiness (1 = happy)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes
Working status (1 = yes)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household characteristics																
Residence area (1 = urban)	Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household number	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			Yes	Yes	Yes
Per capita expenditure (Log)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Appendix 3. Summary Statistic

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
Dependent Variable					
Suffer chronic disease	29,373	2.93%	0.169	0	1
Main Independent Variable					
Persons with Disabilities=1	29,373	1.37%	0.116	0	1
Individual Characteristics					
Gender, Male=1	29,373	46.7%	0.499	0	1
Age of Respondent	29,373	37.30	14.94	14	101
Productive Age of Respondent=1	29,373	95.07%	0.216	0	1
Insurance Ownership, Yes=1	29,373	48.80%	0.500	0	1
Schooling Participation, Yes=1	29,373	96.07%	0.194	0	1
Happiness Level, Happy=1	29,373	91.33%	0.281	0	1
Household Characteristics					
Residence Area, Urban=1	29,373	58.5%	0.493	0	1
Household Number	29,373	4	1.874	1	17
Per Capita Expenditure (in thousands of rupiah)	29,373	Rp 1,111	Rp 985	Rp 72	Rp 22,762
Per Capita Expenditure (Log)	29,373	13.69	0.658	11.19	16.94