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## Logistic Regression and Growth Charts to Determine Children Nutritional and Stunting Status: A Review

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### Abstract

Children malnutrition and stunting are still common in Indonesia. Although Indonesia has succeeded in reducing malnutrition and stunting rates over the past few years, these two issues must still be considered as something serious in order to prevent the increasing number of malnutrition and stunting rates in the future. This study aims to analyze the suitable logistic regression methods and growth charts to reduce the number of children with malnutrition and stunting status. Based on the analysis of previous studies and theories, researchers have found that multinomial logistic regression is the most suitable method to measure children nutritional and stunting status because it can provide more specific results, such as malnutrition, undernutrition, normal nutrition and obese. WHO growth charts – weight-for-age chart that already exists in Kartu Menuju Sehat (KMS) – is suitable to be applied in monitoring child's nutritional status because Indonesia's Anthropometric Standards Assessing Nutritional Status of Children are developed based on WHO Standards. To be able to perform Indonesian children stunting status measurement, WHO length-for-age or height-for-age growth chart needs to be applied.

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*Keywords:* malnutrition; stunting; nutritional status; logistic regression; growth charts

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### 1. Introduction

Malnutrition and stunting are still become the main issues that occur in the world. Almost half of the mortality rate in children under 5 years old in Asia and Africa caused by malnutrition. This causes the death of 3 million children per year<sup>1</sup>. In the year of 2011, Indonesia is ranked 5 of 81 countries with the largest number of stunted children in the world that reached 7.547.000 children. Indonesia is reported to have a larger number of stunting children than some African countries, such as Ethiopia, Democratic Republic of the Congo, Kenya, Uganda and Sudan. During the year of 2007-2011, Indonesia is reported to have moderate and severely wasting, underweight and overweight children that reached 13%, 18% and 14% respectively<sup>2</sup>. In 2012, the mortality rate of children under 5 years in Indonesia reaches 152.000

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people. At least 400 Indonesian children die every day due to low economic rates and infections, such as pneumonia and diarrhea<sup>3</sup>. In 2013, Indonesia has a tendency of child prevalence to be underweight based on indicator of weight-for-age of 19.6%, which is divided into malnutrition status of 5.7% and under nutrition status of 13%, and stunting based on the indicator of height-for-age of 37.2%. The percentage has increased from 2010, that is 4.9% for malnutrition status, 13.0% for under nutrition status and 35.6% for stunting status<sup>4</sup>. Meanwhile, according to DKI Jakarta Provincial Health Profile in 2014, West Jakarta ranked first with malnutrition status with the number reached 319 of 522 children<sup>5</sup>. In particular, according to West Jakarta Health Profile 2014, Palmerah area has 61 of 550 children who are likely to suffer from malnutrition<sup>6</sup>.

Even though Indonesia has successfully managed to reduce the number of under-five stunting children from 48% in 1995 to 36% in 2010 and under-five underweight children from 30% in 1995 to 18% in 2010, Indonesia should not be lulled. Indonesia still have to improve health services to overcome children malnutrition and stunting problems because the number can be increased at anytime as ever happened in Timor Leste, Nepal and Madagascar as shown in Figure 1.

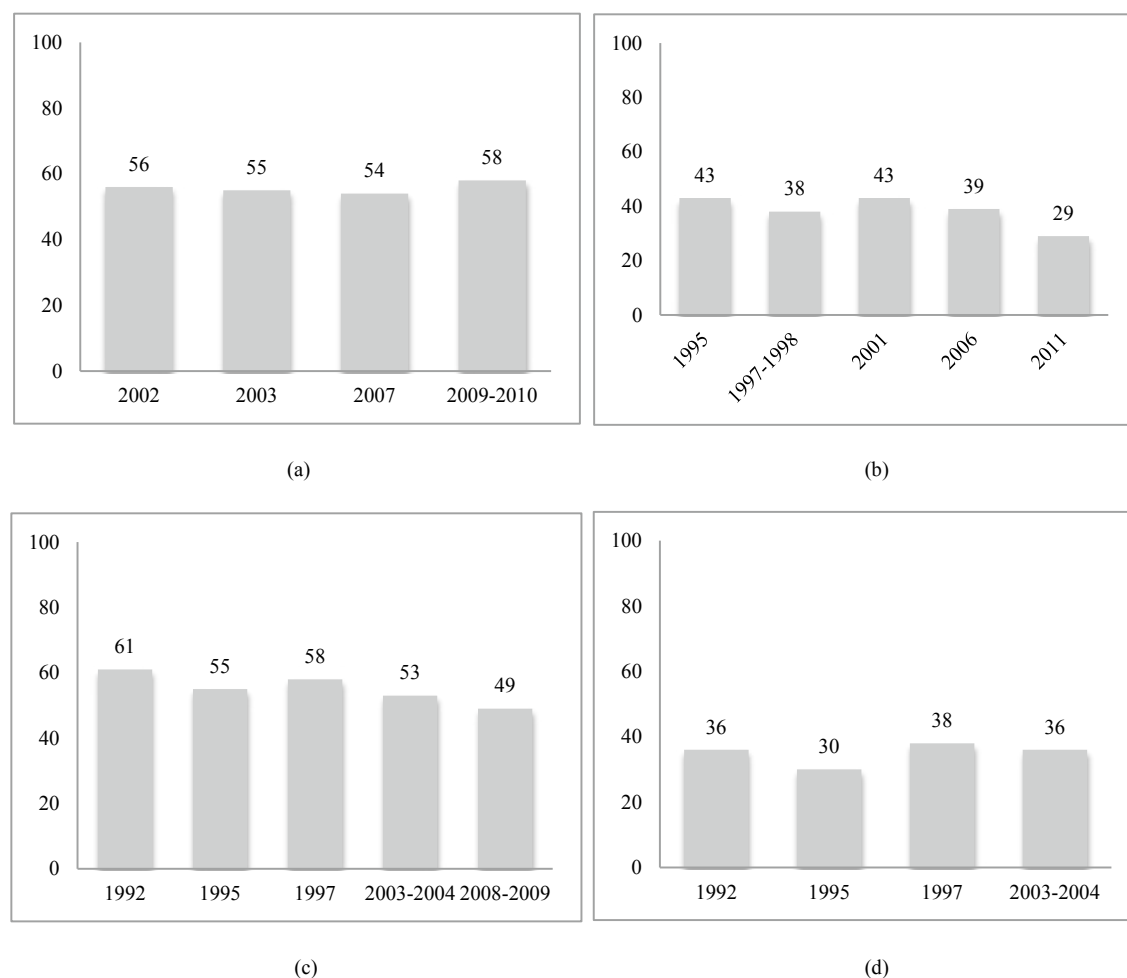


Figure 1: (a) Percentage of under-five stunted children in Timor Leste; (b) Percentage of under-five underweight children in Nepal; (c) Percentage of under-five stunted children in Madagascar; (d) Percentage of under-five underweight children in Madagascar

As shown in Figure 1a, Timor Leste has managed to reduce the number of stunted children from 2002 to 2007, but then the percentage rose to 58% during the year of 2009-2010. Underweight trends in Nepal showed a decline during the year of 1997-1998, but then increased by 5% in 2001 as shown in Figure 1b.

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