Chapter 7
Obesity Levels of Individuals With Intellectual Disabilities: Prediction for Intervention

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ABSTRACT

Individuals with intellectual disabilities (ID) have considerable health inequalities including higher levels of unmet health needs and a shorter life expectancy compared to the general population. The prevalence of obesity, a commonly accepted measure of health inequalities, is higher in people with ID than in the general population, and the factors leading to the increased prevalence among people with ID have not been well understood yet. This has become worse during the COVID-19 pandemic due to nationwide full and partial curfews. In this study, based on a dataset that comprises a set of parameters related to eating habits and physical conditions of a number individuals, the use of classification algorithms for predicting obesity levels of individuals with ID is proposed, and a performance analysis is made using well-known performance metrics. The results could be used by researchers and practitioners in this field to choose the best classifier for their mobile application solutions. Opportunities, research challenges, and future research directions in this topic are also presented.

INTRODUCTION

Intellectual Disabilities (ID) is an equivalent term for mental retardation onset before 18 years of age (American Psychiatric Association, 2013), and comprises additional support needs in at least two of the following domains: functional academic skills, communication, social and interpersonal skills, self-direction, self-care, home living, safety, health, work, leisure and use of community resources. The level of

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ID can be categorized into four classes as profound, severe, moderate and mild. People with ID suffer from considerable health inequalities compared to the general population and have significant levels of unmet health needs (Lennox, Diggens, & Ugoni, 1997; Royal College of General Practitioners Working Party, 1990), a shorter life expectancy (Patja *et al.*, 2000; Bittles *et al.*, 2002) and higher mortality rates (McGuigan, Hollins, & Attard, 1995; Decouflé & Autry, 2002). Obesity and being overweight are independent risk factors for chronic diseases, which could result in reduced life expectancy (Hubert *et al.*, 1983).

As it has been shown, obesity is one of the internationally agreed health indicators for people with ID (Walsh, Kerr, & Van Schrojenstein Lantman-de Valk, 2003; Melville *et al.*, 2007) and one of the reasons of the reduced life expectancy and higher health needs of people with ID (Janicki *et al.*, 2002). Therefore, the International Association for the Scientific Study of Intellectual Disabilities clearly emphasized the impact and management of obesity on health and quality of life of people with ID (Lennox *et al.*, 2002). Body Mass Index (BMI) is a measure of body fat and applies to adults. It is calculated using Equation (1). Obesity is classified based on BMI value as listed in Table 1.

$$Body\,mass\,index = \frac{Weight}{Height * Height} \tag{1}$$

Table 1. Obesity classification

BMI (kg/m^2)	Weight Status	Risk of Co-morbidities
<18.5	Underweight	Low
18.5-24.9	Normal	Average
25.0-29.9	Pre-obese	Increased
30.0-34.9	Obese I	Moderate
35.0-39.9	Obese II	Severe
≥40	Obese III	Very severe

(adopted from (World Health Organization, 1998))

The early onset of obesity requires the implementation of early intervention or secondary prevention to start as early as possible (Wen, Rissel, & He, 2017). Therefore, prediction of obesity plays a key role for further steps. In this study, a dataset comprised of a set of parameters related to eating habits and physical conditions of individuals between the ages 14 to 61 in Mexico, Peru and Colombia is used to predict obesity levels. Sequential Minimal Optimization (SMO) and K-Nearest Neighbors (KNN) algorithms have been used to predict the obesity levels of individuals and then the results obtained have been compared. For performance evaluation, confusion matrix, accuracy rate and error values have been used.

BACKGROUND AND RELATED WORK

After World Health Organization (1998) introduced BMI, the Centers for Disease Control and Prevention (CDC) introduced the clinical use of BMI in growth charts for young males and females (Guo, Wu,