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Decision Support System for Mall Nutrition Using *Simple Additive Weighting* (SAW) Method

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Abstract-**The background of this research concerns the background by the number of severely malnourished children are increasing each year. Currently the data processing system and the calculation of the nutritional status of children under five are still using manual systems. Reporting nutritional status of children still using paper media which resulted in the frequent occurrence of data redundancy toddlers and infants often data loss occurs. To the authors conducted in-depth research that focuses on how to do the reporting and determination of the nutritional status of infants is more effective and efficient utuk always monitoring early childhood development. So in scientific research, the writer make an application determinants of nutrition in infants to help health centers in Mount harbor reporting and monitoring.**

This application method is used to support the assessment of nutritional status of children in health centers Mount Labuan is Simple Additive Weighting (SAW). SAW method is to find a weighted summation of rating the performance of each alternative on all attributes (Fishburn, 1967) (MacCrimmon, 1968). This method is the most famous and most widely used in dealing with situations of Multiple Attribute Decision Making (MADM). MADM itself is a method used to find the optimal alternative of a number of alternatives to certain criteria

Keyword : Saw, decision support systems, information systems and Java.

I. INTRODUCTION

Nutrition in children under five years of age (infants) are factors to consider in maintaining health, since infancy is a vulnerable period of development of nutrition. Deaths occurred in infants is a result of poor nutrition. Poor nutrition starts from the weight loss of a child until he looks very bad. Based around the Indonesian Health Department reports a decline in malnutrition which in 2005 recorded 76 178 cases and then dropped to 50 106 cases in 2006 and 39 080 cases occurred in 2007. The decline in malnutrition over the years this has not been established because of the case unreported.

symptoms that mark children clinically malnourished can be characterized as follows: Marasmus (Children are very thin, like the old man's face, concave stomach, skin wrinkles and maudlin), Kwashiorkor (swelling throughout the body, especially the legs, rounded and swollen face, thin hair , redness, irritability, and apathy muscles shrink), and Marasmus-Kwarshiorkor.

Preliminary examination of the symptoms of malnutrition, is quite difficult in the set, then built a system that can help people to be easily able to solve the problem. The method can be used is the SAW (Simple Additive Weighting). SAW method is to find a weighted summation of rating the performance of each alternative on all attributes (Fishburn, 1967) (MacCrimmon, 1968).

SAW method requires the decision matrix normalization process (X) to a scale that can be compared with all the ratings of the alternatives. This method is the most famous and most widely used in dealing with situations of Multiple Attribute Decision Making (MADM). MADM itself is a method used to find the optimal alternative of a number of alternatives to certain criteria.

From the above background, the researchers raised the heading "Decision Support System Diseases Malnutrition Using Simple Additive Weighting Method (SAW)".

II. LITERATUR REVIEW

Multiple Attribute Decision Making (MADM)

Multiple Attribute Decision Making (MADM) is a method used to find the optimal alternative of a number of alternatives to certain criteria. The essence of MADM is to determine the weights for each attribute value, then proceed with the process of ranking the alternatives that will select already given.

Many cases with MADM using SAW method to look for an alternative. A common problem is the difficulty of choosing which method is most relevant to solve a problem by using MADM models. SAW method is also a method of MADM simplest and most widely used. This method is also the easiest method to be applied, because it has an algorithm that is not too complicated.

System Addictive Weighting (SAW)

Is a weighted sum method. The basic concept is to find a method of SAW weighted summation of rating the performance of each alternative on all criteria (Kusumadewi, 2006). SAW method requires the decision matrix normalization process (X) to a scale that can be compared with all the alternative rating ada.Metode SAW recognize the existence of two (2) attributes that criterion gains (benefits) and cost criteria (cost). The fundamental difference of the two criteria is in the selection criteria when making decisions.

Research Method

Step by step *Simple Additive Weighting Method* (SAW) for malnutrition prediction

a. Alternative Determination.
   In this study, alternative toddler nutritional status assessed by AB1 to AB10, with the following description:

$$W = [\, W_1, W_2, W_3, \ldots, W_J]$$

AB1=Toddlers 1
AB2=Toddlers 2
AB3=Toddlers 3
AB4=Toddlers 4
AB5=Toddlers 5
AB6=Toddlers 6
AB7=Toddlers 7
AB8=Toddlers 8
AB9=Toddlers 9
AB10=Toddlers 10

b. Indicators marked with the assessment criteria C1 through C5 with the following details

   1. Weight (C1)
   2. Tall (C2)
   3. Age (C3)
   4. Wrist Circumference (C4)
   5. abdominal circumference (C5)

c. Determining the Likert scale or a scale with the value of nutritional status:

Catogory	poin(Cut Of Point)
More nutrition	>120 % Median BB/U Standard WHO NCHS
Good Nutrition	80 % -120% Median BB/U Standard WHO-NCHS
Medium Nutrition	70 %-79,9% Median BB/U Standard WHO-NCHS
Less Nutrition	60 %-69,9% Median BB/U Standard WHO-NCHS
Mall Nutrition	< 60 % Median BB/U Standard WHO- NCHS

(Supariasa, 2001)

Weight of preference or level of importance of each indicator, given to each indicator value (2,2,2,2), where the weighting preference or interest rate is taken from the health center management wisdom Mount Labuan Waykanan on manual calculations. The following data will be known toddler nutritional status in Table as follows:

Toddlers Table

	C1	C2	C3	C4	C5
AB1	20	100	40	30	60
AB2	30	80	50	30	70
AB3	25	70	40	20	40
AB4	18	80	35	25	55
AB5	25	70	40	15	40
AB6	20	70	40	30	60
AB7	30	65	50	30	70
AB8	25	60	40	20	40
AB9	18	70	35	25	55
AB10	25	70	40	15	40

Making the decision matrix of weighted scores of each alternative on each indicator:

$$X = \begin{bmatrix} x_{11}\, x_{12} \ldots x_{1j} \\ \vdots \quad \vdots \\ x_{i1}\, x_{i2} \ldots x_{ij} \end{bmatrix}$$

R=

20	100	40	30	60
30	80	50	30	70
25	70	40	20	40
18	80	35	25	55
25	70	40	15	40
20	70	40	30	60
30	65	50	30	70
25	60	40	20	40

R=

0.666666667	1	0.8	1	0.857142857
1	0.8	1	1	1
0.833333333	0.7	0.8	0.666666667	0.571428571
0.6	0.8	0.7	0.833333333	0.785714286
0.833333333	0.7	0.8	0.5	0.571428571
0.666666667	0.7	0.8	1	0.857142857
1	0.65	1	1	1
0.833333333	0.6	0.8	0.666666667	0.571428571
0.6	0.7	0.7	0.833333333	0.785714286
0.833333333	0.7	0.8	0.5	0.571428571

18 70 35 25 55

25 70 40 15 40

d. Conducting the process of normalization matrix (Rij)

$$r_{ij} = \begin{cases} \frac{x_{ij}}{Max_i(x_{ij})} \\ \frac{Min_i x_{ij}}{x_{ij}} \end{cases}$$

r11 $\frac{20}{MAX(20,30,25,18,25,20,30,25,18,25)}$ 0.666666667

r12 = $\frac{30}{MAX(20,30,25,18,25,20,30,25,18,25)}$ 1

r13 = $\frac{25}{MAX(20,30,25,18,25,20,30,25,18,25)}$ 0.833333333

r14 = $\frac{18}{MAX(20,30,25,18,25,20,30,25,18,25)}$ 0. 6

r15 = $\frac{25}{MAX(20,30,25,18,25,20,30,25,18,25)}$ 0. 83333333

r16 = $\frac{20}{MAX(20,30,25,18,25,20,30,25,18,25)}$ 0. 66666667

r17 = $\frac{30}{MAX(20,30,25,18,25,20,30,25,18,25)}$ 1

r18 = $\frac{25}{MAX(20,30,25,18,25,20,30,25,18,25)}$ 0.833333333

r19 = $\frac{18}{MAX(20,30,25,18,25,20,30,25,18,25)}$ 0.6

e. Membentuk matrik ternomalisasi

$$R = \begin{bmatrix} r_{11} r_{12} \dots r_{1j} \\ \vdots \quad\quad \vdots \\ r_{i1}\, r_{i2} \dots r_{ij} \end{bmatrix}$$

And The Result Is

The process of determining the nutritional status

	C1	C2	C3	C4	C5	Value	Nutrition Status
AB1	0.66666	1	0.8	1	0.85714	86.5 %	Good Nutrition
AB2	1	0.8	1	1	1	96.0 %	Good Nutrition
AB3	0.8333	0.7	0.8	0.666666667	0.57142	71.4 %	Medium Nutrition
AB4	0.6	0.8	0.7	0.833333333	0.78571	74.4 %	Medium Nutrition
AB5	0.8333	0.7	0.8	0.5	0.57142	68.1 %	Less Nutrition
AB6	0.66666	0.7	0.8	1	0.85714	80.5 %	Good Nutrition
AB7	1	0.65	1	1	1	93.0 %	Good Nutrition
AB8	0.83333	0.6	0.8	0.666666667	0.57142	69.4 %	Less Nutrition
AB9	0.6	0.7	0.7	0.833333333	0.78571	72.4 %	Medium Nutrition
AB10	0.8333	0.7	0.8	0.5	0.57142	68.1 %	Less Nutrition

$$V_i = \sum_{j=1}^{n} W_j r_{ij}$$

AB1={((2*0.666666667) + (2*1) + (2*0.8)+(2*0.857142857))*(10/100))}=86%

Because the value of 86% AB1 is on the Likert scale 80% - 120% median W / A Standard WHO-NCHS, the nutritional status is Good Nutrition.

III. RESULT AND DISCUSSION

Diagnosis Diagnosis Process nutritional status of infants using the Simple Additive Weighting Method (SAW)

The data is the data sample is tested, the data taken twenty children, namely:

Data normalization is a data sample tested, the data taken twenty children, namely:

No Toddlers	Weight (Kg)	Tall (cm)	Age (moon)	wrist circumference (cm)	abdominal circumference (cm)
1	20/30	100/100	40/50	30/30	60/60
2	30/30	80/100	50/50	30/30	70/60
3	25/30	70/100	40/50	20/30	40/60
4	18/30	80/100	35/50	25/30	55/60
5	25/30	70/100	40/50	15/30	40/60
6	20/30	70/100	40/50	30/30	60/60
7	30/30	65/100	50/50	30/30	70/60
8	25/30	60/100	40/50	20/30	40/60
9	18/30	70/100	35/50	25/30	55/60
10	25/30	70/100	40/50	15/30	40/60
11	24/30	50/100	50/50	30/30	40/60
12	20/30	60/100	40/50	25/30	30/60
13	15/30	65/100	40/50	20/30	55/60
14	18/30	70/100	30/50	25/30	45/60
15	17/30	50/100	45/50	15/30	45/60
16	20/30	45/100	40/50	18/30	40/60
17	24/30	65/100	35/50	19/30	50/60
18	25/30	65/100	40/50	20/30	50/60
19	26/30	55/100	40/50	20/30	50/60
20	24/30	60/100	40/50	30/30	40/60

No Toddlers	Weight (Kg)	Tall (cm)	Age (moon)	wrist circumference (cm)	abdominal circumference (cm)
1	20	100	40	30	60
2	30	80	50	30	70
3	25	70	40	20	40
4	18	80	35	25	55
5	25	70	40	15	40
6	20	70	40	30	60
7	30	65	50	30	70
8	25	60	40	20	40
9	18	70	35	25	55
10	25	70	40	15	40
11	24	50	50	30	40
12	20	60	40	25	30
13	15	65	40	20	55
14	18	70	30	25	45
15	17	50	45	15	45
16	20	45	40	18	40
17	24	65	35	19	50
18	25	65	40	20	50
19	26	55	40	20	50
20	24	60	40	30	40
Max	**30**	**100**	**50**	**30**	**70**

No Toddlers	Weight (Kg)	Tall (cm)	Age (moon)	wrist circumference (cm)	poin (Cut Of Point)	Nutrition Status
0.6666	1	0.8	1	0.8571	86.50%	Good Nutrition
1	0.8	1	1	1	96.00%	Good Nutrition
0.8333	0.7	0.8	0.66666	0.5714	71.40%	Medium Nutrition
0.6	0.8	0.7	0.83333	0.7857	74.40%	Medium Nutrition
0.8333	0.7	0.8	0.5	0.5714	68.10%	Less Nutrition
0.66666	0.7	0.8	1	0.8571	80.50%	Good Nutrition
1	0.65	1	1	1	93.00%	Good Nutrition
0.8333	0.6	0.8	0.66666	0.5714	69.40%	Less Nutrition
0.6	0.7	0.7	0.83333	0.7857	72.40%	Medium Nutrition
0.8333	0.7	0.8	0.5	0.5714	68.10%	Less Nutrition
0.8	0.5	1	1	0.5714	77.40%	Medium Nutrition
0.6666	0.6	0.8	0.8333	0.4285	66.60%	Less Nutrition
0.5	0.65	0.8	0.66666	0.7857	68.00%	Less Nutrition
0.6	0.7	0.6	0.8333	0.6428	67.50%	Less Nutrition
0.5666	0.5	0.9	0.5	0.6428	62.20%	Less Nutrition
0.6666	0.45	0.8	0.6	0.57142	61.80%	Less Nutrition
0.8	0.65	0.7	0.6333	0.71428	70.00%	Less Nutrition
0.8333	0.65	0.8	0.6666	0.7142	73.30%	Medium Nutrition
0.8666	0.55	0.8	0.6666	0.7142	72.00%	Medium Nutrition
0.8	0.6	0.8	1	0.5714	75.40%	Medium Nutrition

Here's Nutritional Status Toddlers were tested, namely:

No Balita	Status Gizi
1	Good Nutrition
2	Good Nutrition
3	Medium Nutrition
4	Medium Nutrition
5	Less Nutrition
6	Good Nutrition
7	Good Nutrition
8	Less Nutrition
9	Medium Nutrition
10	Less Nutrition
11	Medium Nutrition
12	Less Nutrition
13	Less Nutrition
14	Less Nutrition
15	Less Nutrition
16	Less Nutrition
17	Less Nutrition
18	Medium Nutrition
19	Medium Nutrition
20	Medium Nutrition

IV. CONCLUSION

Based on the results of the study, Decision Support Systems MallNutrition Disease Using Simple Additive Weighting Method (SAW) can be deduced that SAW method can be used to determine the status of malnutrition in children under five.

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