

How do we estimate case load for SAM and / or MAM in children 6 – 59 months in a given time period?

Mark Myatt, Consultant Epidemiologist, Brixton Health

A common approach to this problem is to use the formula:

$$\text{case load} = N \times P \times K \times C$$

where:

N is the size of the population in the program area. This is usually the population aged between 6 and 59 months which, in low income countries, is commonly estimated as 20% of the total population.

P is estimated prevalence of SAM or MAM. This is usually estimated using a nutritional anthropometry survey (e.g. a SMART survey). It is important that prevalence is estimated for the program's admitting case-definition. This is likely to be different from the “headline” SAM prevalence estimate found in survey reports which will usually be based solely on WHZ and oedema. Typical admitting case-definitions for SAM are:

MUAC < 115 mm or bilateral pitting oedema

MUAC < 115 mm or bilateral pitting oedema or WHZ < -3

MUAC < 115 mm or bilateral pitting oedema or WHM < 70%

Typical admitting case-definitions for MAM are:

MUAC < 125 mm or bilateral pitting oedema

MUAC < 125 mm or bilateral pitting oedema or WHZ < -2

MUAC < 115 mm or bilateral pitting oedema or WHM < 80%

Some agencies and governments use a single admitting case-definition for acute malnutrition:

MUAC < 120 mm or bilateral pitting oedema

The method outlined here may be used with any of the above admitting case-definitions. It may also be used with WHZ or WHM defined using either the NCHS or WGS reference populations.

K is a correction factor to account for new (incident cases) over a given time period.

C is expected mean program coverage over a given time period. Program coverage may range from 10% to 90%. It should be noted that programs that place emphasis on using weight-for-height in admitting case-definitions tend to achieve considerable lower levels of coverage than programs that place emphasis on using MUAC in admitting case-definitions.

Deciding appropriate input values for N , P , K , and C

An appropriate value for N is usually derived from census data. In some settings, certain factors may lead to census data not being accurate (e.g. political manipulation, the absence of a functioning civil society, population displacement, and poor security). Population estimates should, therefore, be corrected by the application of estimates of population growth, for displacement, migration, and mortality in the target population.

An appropriate value for P for SAM is usually estimated with poor relative precision. For example, a SMART survey with a sample size of 600 and a design effect of 1.5 may return an estimate of SAM prevalence of 1.25% with a 95% confidence interval (CI) of 0.41% – 2.89%. Prevalences for GAM and MAM are, however, usually estimated with better relative precision.

K is estimated from:

$$incidence = \frac{prevalence}{average\ duration\ of\ untreated\ disease}$$

The average duration of episodes of untreated SAM and MAM is usually taken to be 7.5 months. This yields:

$$incidence = prevalence \times \frac{t}{7.5}$$

where t is the time period specified in months. For a year this is:

$$incidence = prevalence \times \frac{12}{7.5} = prevalence \times 1.6$$

Need can be estimated as the sum of prevalent cases and incident cases:

$$need = prevalence + \left(prevalence \times \frac{t}{7.5} \right)$$

K can be estimated as:

$$K = 1 + \frac{t}{7.5}$$

For a year this is:

$$K = 1 + \frac{12}{7.5} = 2.6$$

C is the mean coverage that is expected to be achieved by the program over the time period. This depends on the type of program and how well the program operates in terms of case-finding, recruitment, and retention.

An example calculation:

Population : 121,400	$N = 121,400 \times 0.173 = 21,002$
Proportion 6 – 59 months : 17.3%	
Prevalence of SAM : 1.34%	$P = 0.0134$
Time period : 1 year	$K = 1 + \frac{12}{7.5} = 2.6$
Mean expected coverage : 56%	$C = 0.56$

The expected case load is:

$$\text{case load} = 21,002 \times 0.0134 \times 2.6 \times 0.56 = 410$$

A 95% confidence interval could be calculated using the upper and lower 95% confidence limits for *P* in the formula. Confidence intervals will usually be very wide for SAM. This is due to the lack of precision in the estimate of SAM prevalence available from typical nutritional anthropometry surveys.

The overall case-load for SAM can also be used to estimate the need for inpatient (stabilisation) care. At the start of a program there may be a large number of complicated cases. In this context, the need for inpatient care will be high (e.g. 15% of prevalent cases). Using the example data:

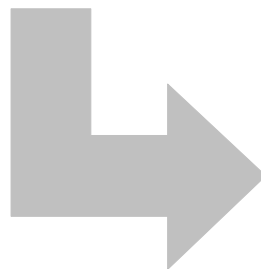
$$\text{initial inpatient demand} = 21,002 \times 0.0134 \times 0.15 \times 0.56 = 24$$

The need for inpatient care should, in a well CMAM functioning program, decline over time and not exceed 5% of estimated case-load over the specified time-period. Using the example data:

$$\text{ongoing inpatient demand} = 410 \times 0.05 = 21$$

Case-load calculations can be automated using a simple spreadsheet:

	A	B
1	Population	121400
2	Proportion 6–59 months	17.3
3	Prevalence	1.34
4	Period	12
5	Coverage	56
6		
7	Expected case-load	=ROUND(B1*(B2/100)*(B3/100)*(1+B4/7.5)*(B5/100))



	A	B
1	Population	121400
2	Proportion 6–59 months	17.3
3	Prevalence	1.34
4	Period	12
5	Coverage	56
6		
7	Expected case-load	410

It should be noted that this is an approximate method. This is due to uncertainty in all of the variables.

This FAQ response was drafted by Mark Myatt (Consultant Epidemiologist, Brixton Health) on 30th May 2012.

The material presented in FAQ response to this frequently asked question is based on:

Garenne M, Willie D, Maire B, Fontaine O, Eeckels R, Briend A, Van den Broeck J, *Incidence and duration of severe wasting in two African populations*, Public Health Nutr. 2009 Nov;12(11):1974-82

Anon, *WHO, UNICEF, WFP and UNHCR Consultation on the Programmatic Aspects of the Management of Moderate Acute Malnutrition in Children under five years of age 24-26 February 2010*, WHO, Geneva, 2010

MacMahon B, Pugh TF, *Epidemiology Principles and Methods*, Little Brown & Company, Boston, USA, 1970

Miettinen O, *Estimability and estimation in case-referent studies*, American Journal of Epidemiology, 1976;103(2):226–235