

NT Analyzer Documentation For FP-1B and FP-1T

This document explains how to use the NT analyzer spreadsheet (EXCEL) to calculate NT median equations and evaluate sonographer-specific parameters that have been suggested for epidemiological monitoring. The EXCEL spreadsheet is cumulative in that new sonographer data is added to the existing for previously identified sonographers, and any updates to the template will be automatically included in each distribution. The EXCEL template, using sonographer GNG as an example can be used to analyze any set of NT measurements supplied by the Survey or, for analyses of a sonographer in your own program.

Example: Analysis of NT Data for Sonographer GNG, using the EXCEL templates

The data in this example simulates a “blunder” (*i.e.*, a CRL of 178 mm is entered rather than 78 mm). Begin this exercise by selecting the ‘GNG Example’ worksheet from the NT analyzer spreadsheet (EXCEL) You should see ID numbers in the first column beginning with 2065.

Table 1 shows the column heading in the first worksheet titled “GNG Example”. Values in the highlighted blue section are computed automatically by the Excel program and **should not be touched**. Data has been entered in the first three columns in the exact order specified.

Table 1. Column listings/contents for EXCEL template, worksheet “GNG Example”

Column	Name	Content
A	IC	Patient identifier (not an actual patient ID)
B	CRL mm	Raw data from sonographer GNG
C	NT mm	Raw data from sonographer GNG
D	Inter GA	Calculated GA from CRL using Hadlock <i>et al.</i> , 1992
E	CRL mm	Trimmed CRL (blank indicates values has been trimmed)
F	NT mm	Trimmed NT (blank indicates values has been trimmed)
G	Log NT	Base 10 logarithm of NT (column F)
H	NT MoM	NT expressed as multiple of the median (MoM)
I	Log NT MoM	Base 10 logarithm of NT MoM (column H)
J	NT median (A)	NT median for this patient based on GA regression
K	NT median (B)	NT median for this patient based on CRL regression

Upper right-hand corner of the worksheet “GNG Example”

The upper and lower NT cut-off levels are preset at 0.1 mm and 4.0 mm. The aim of these cut-off levels are to trim out blunders and extremely high NT values. These high values may be correct, but since they do not represent the general population of unaffected pregnancies, they need to be excluded from analysis. If you want ‘no trimming’, set these cut-off levels to very small (e.g., 0) and very high (e.g., 10) values. The selection of the CRL cut-off levels is dependent on your laboratory’s choice of the screening window. The preset values of 35 and 78 mm are those that correspond to 10 weeks 3 days to 13 weeks 6 days using the ‘Hadlock 92’ equation. Change these if you use some other CRL-based gestational age window for NT measurements.

Based on the above NT and CRL cut-off levels, the following values will be automatically computed, and columns F through N will be blank (indicating trimming).

- Number of original data points ____
- Number of points trimmed ____
- Final number of data points ____

Middle right-hand side of the worksheet “GNG Example”

Section (A): Coefficients of Intercept (a) and Slope (b) for Log (NT) regressed against GA (in decimal weeks) for equation of the form

$$\log NT = a + b \cdot GA, \text{ or, } NT = 10^{(a + b \cdot GA)}.$$

Section (B): Coefficients of Intercept (a) and Slope (b) for Log (NT) regressed against CRL (in mm) for equation of the same form as in Section (A). Note that the two methods yield exactly the same median values (column M and N) and NT MoM levels (column K).

Lower right-hand side of the worksheet “GNG Example”

The following parameters are used for epidemiological monitoring of NT measurements. These three values are within the expected range of results.

- Percent increase in NT values per week
- Base 10 logarithmic standard deviation of the NT MoM levels
- Overall median NT MoM (grand MoM). Since these data are being used to demonstrate the computation of reference data, the expected value here should be 1.00. This template is not designed to evaluate the NT MoM levels found in practice. That parameter could be estimated by finding the middle values of the observed values.

Worksheet “GNG Graphic”

Now click on the worksheet titled “GNG Graphic”. This worksheet is designed to use columns F, G, and H of the “GNG Example” to graphically display the NT measurements (logarithmic vertical axis) versus either CRL (top graphic) or gestational weeks (bottom graphic) on the linear horizontal axis. Empty rows represent trimmed data. If you want to plot the untrimmed data, copy columns B and C from “GNG Example”, rather than copying columns G and H. The graphics allows one to examine the data for outliers that may not have been trimmed, visualize the expected increase per week (slope) and the spread of the data (log standard deviation).

Column A: Gestational age copied from column F (GNG Example). The GA has been calculated from the reported CRL using the equation of Hadlock 1992.

Column B: CRL as copied from column G (GNG Example).

Column C: NT as copied from column H (GNG Example). Note that NT of 1.7 in cell C15 is reasonable, reinforcing the idea that the CRL in B15 is a data entry error.

Graphic [NT versus CRL]. The data are evenly spread across the CRL window with a clear positive slope. The spread of data is about what is expected. No outliers are visible. If you were to plot the data prior to trimming, most of the data would be compressed at the left of the graph

Graphic [NT versus GA]. Data is displayed without trimmed data because a GA has not been calculated for outlying data points on the GNG Example worksheet. If it is desired to have trimmed data displayed it is necessary to go back and alter the cut-offs selected for either NT or CRL, or both.

Note: If the graphic doesn't display correctly when new data are entered, it may be because of the specific data range. To check (and to modify) this range, right click on the gray plotting area for the top graphic and then click on 'source data' in the displayed menu. The range will be displayed in the following format =Graphic!\$B\$2:\$C\$150 This indicates that the data from cell B2 through C150 are used. If you have only entered 75 observations, for example, modify the 150 to 75, hit enter, and the plot should display correctly. The display is a little more complex for the lower graphic, but similar changes would be needed.

¹ Hadlock FP et al. 1992. Fetal-crown rump length: reevaluation of relation to menstrual age (5-18 weeks) with high-resolution real-time US. *Radiology*, 182:501-5

Documentation: Using the EXCEL template to analyze NT measurements

If you have not already worked through the “GNG Example”, please do so first. This will teach you what the template and associated graphic can do. You will also find a blank template entitled “Blank Template”. This worksheet has no data entered, but does have all of the appropriate formula and formatting included.

- Make a copy of the “Blank Template” and “Blank Graphic” in 2 other worksheets or in another spreadsheet and name the files/worksheets appropriately.
- The template is designed to hold up to 200 observations (the yellow and blue fill disappear after row 203). If you have more than this, extend columns A through N as needed. The number of observations is automatically computed (cell R8).
- Modify the NT and CRL cut-off levels in mm as needed (cells R4 to R6).
- You now need to populate the spreadsheet with your own NT dataset formatted as specified. The first, second and third columns must be in the specified order (ID, CRL in mm and NT in mm) and no more than these three columns can be entered. If you do not have an ID, it doesn't matter – leave it blank. There is no need to sort the data, but doing so might make it easier to check for data entry errors. Do not include any new headings, and start the data in row 4.
- Once the data are pasted into columns A through C, the analyses should be completed.
- To use the graphic, paste the data only (row 4 on) for columns F through H into the appropriate cell in the Graphic worksheet.
- When printing, you may want to specify the number of pages to print, especially if you have used a large number of observations in the past. EXCEL seems to want to print to the last cell used.