Overview:

This Excel spreadsheet has been developed as a companion tool for the JCRS guest editorial:

> Wang L, Koch DD, Hill WE, Abulafia A. Pursuing perfection in intraocular lens calculations: III. Criteria for analyzing outcomes. *Journal of Cataract and Refractive Surgery* 2017; 43(8): 999-1002.

It will automatically generate up to 4 histograms (based on up to 4 different formulas) of the predicted postoperative spherical equivalent (SEQ) numerical errors. Also shown in this figure are the percentages of eyes with prediction errors less than or equal to 0.25 D, 0.50 D, and 1.00 D; and mean numerical error (MNE), standard deviation (SD), minimal prediction error (Min), maximal prediction error (Max), mean absolute prediction error (MAE), and median absolute prediction error (MedAE).

Note:

Please read these instructions in their entirety before entering any data into the Excel spreadsheet and performing analysis for IOL-based surgery. There are certain formatting conditions that, if not followed, may create unanticipated errors. None of the fields should be left blank within the spreadsheet. If any fields are left blank, errors in data analysis will occur.

System requirements:

This Excel spreadsheet has been tested with Office 365 (for PC) using Windows 10 Pro (version 1803) with a 64-bit operating system and a 3,000 x 2,000 resolution display. It was also tested with Office 365 (for Mac, version 16.37) using the Catalina Mac OS, version 10.15.4 and a 2,560 x 1,600 resolution display. For Mac users, the Excel copy icons are not functional.

Worksheets - Overview:

There are two worksheets within this Excel workbook. These worksheets, and the purpose of each, are the following:

1. **Data_Input** - This worksheet provides for the input of user data.

2. **Figures** - This worksheet will automatically generate up to 4 histograms of the predicted postoperative SEQ numerical errors. Also shown in these figures are the number of eyes that were included, the percentages of eyes with prediction errors less than or equal to 0.25 D, 0.50 D and 1.00 D. In addition, mean numerical error (MNE), standard deviation (SD), minimal prediction error (Min), maximal prediction error (Max), mean absolute prediction error (MAE), and median absolute prediction error (MedAE) are displayed.

The Data_Input Worksheet

There are seventeen columns (Columns A-B, D-G, I-M, O-R, T and V) where data are entered. They are arranged in the following manner:

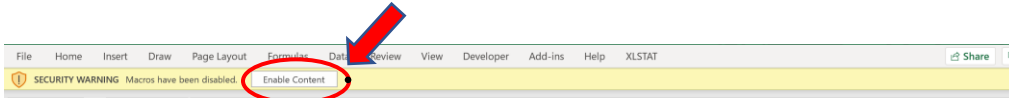| Column Letter	Column Title	Description
A	**No.**	This cell generates a row number automatically.
B	**IOL Power**	This cell records the power in diopters of the IOL that was implanted. The allowable data range is from -10.00 D to +50.00 D.
D - G	**Postoperative Prediction (SEQ)**	These columns record the post-operative spherical equivalent prediction, in diopters, of up to four different formulas based on the IOL power that was implanted. The allowable data range is from -30.00 D to +30.00 D.
I	Postoperative Refraction: **Sphere**	This cell records the post-operative refraction Sphere value. The allowable data range is from -30.0 D to +30.0 D.
J	Postoperative Refraction: **Cylinder**	This cell records the post-operative refraction Cylinder value. Both positive and negative cylinder values can be used. The allowable data range is from -30.0 D to +30.0 D.
K	Postoperative Refraction: **Axis**	This cell records the post-operative refraction cylinder axis value. The allowable data range is from 000° to 180°.
L	Postoperative Refraction: **SEQ**	This cell generates the postoperative spherical equivalent refraction value.
M	Postoperative Refraction: **Adj-SEQ**	This cell generates the adjusted postoperative spherical equivalent refraction value, based on the examination & adjusted lane length that were entered by the user (cells R1 and R3 respectively).
O - R	**Postoperative SEQ Numerical Error**	These cells generate the postoperative spherical equivalent Numerical (Arithmetic) errors, in diopters, of up to four different formulas based on the IOL power that was implanted. (Postoperative refraction – Postoperative prediction). Cells will be highlighted in red for any value not between the range of -0.50 and +0.50 D.

T	**Postop CDVA**	This cell records the postoperative corrected distance visual acuity in meters or feet (according to the user choice in cell T3). The data in the entire row will not be used for analyses if this value will be greater than 12 or 20, respectively; in this case the cell will be highlighted in yellow, and an Error value will appear in the corresponding cell in column V.
V	**Integrity check**	This cell generates an integrity check for each individual row. In the case of missing data, an "Error" output is displayed, otherwise an "OK" output is displayed.

Additional input/output cells:

Cells E1,G1,J1 and L1	Formula 1 - 4	These cells record the names of 1-4 formulas that the user would like to analyze. These values are copied to cells D6-G6 and O6-R6 as well as to the top left corner of the 4 histograms on the figures' worksheet.
Cell F3	Biometry device	F3 cell records the name of the biometry device that was used to generate the input data.
Cell J3	IOL type	J3 cell records the name of the IOL type that was implanted.
Cell R1	Examination lane length	R1 cell records the examination lane length (in meters) that was used for the postoperative refraction. The allowable data range is from 2.0 to 10.0 meters.
Cell R3	Adjusted lane length	R3 cell records the desired adjusted lane length. The user can choose one out of three options from a list: 4 meters, 6 meters or infinity.
Cell T3	CDVA Units	T3 cell records the desired units for the postoperative CDVA. The user can choose one out of two options from a list: meters or feet.
Cell Y1	Error Check	Y1 cell generates an integrity check for the whole spreadsheet. In case that there is an "Error" output on one or more of any individual row's integrity check, or if cells F3/J3 are left blank, an "Error" output will be displayed, otherwise an "OK" output is displayed.
Cell Y3	Empty Rows	Y3 cell generates an integrity check for the existence of any blank rows within the entered data that will lead to an incorrect display of the double angle plots diagrams. In case of a blank row an "Error" output is displayed, otherwise an "OK" output is displayed.
Cell Y5	# of eyes "OK"	Y5 cell generates the number of rows with an integrity check indicated as "OK".
Cell Y6	# of eyes "Error"	Y6 cell generates the number of rows with an integrity check indicated as "Error".
Cell Y7	# of eyes Total	Y7 cell generates the total number of cases that were entered by the user (Y5+Y6).

To utilize this spreadsheet please follow these steps:

I. The Data_Input Worksheet is the only point of data entry for the user. The Excel "protected sheet" option is turned on; hence, only unprotected cells are available to the user.

II. In case a security warning regarding macros appears, the user should click "Enable Content".

III. Enter the desired formula names (cells E1, G1, J1 and L1).

IV. Enter the name of your Measuring device (cell F3).

V. Enter the IOL type that were implanted (cell J3).

VI. Enter the Examination lane length in meters (cell R1).

VII.   Choose the desired Adjusted lane length: 4 meters, 6 meters or Infinity (cell R3).

VIII.   Choose the desired units for the CDVA: meters or feet (cell T3).

IX.   Insert / Edit a Record:

a.   Enter patient data starting from column B ('IOL Power' column) of row number 7. Please notice, row number 7 contains data as an example, and the user should override this data. **This row should not be deleted by the "clear content" option!**

b.   For values that are outside of the allowed range, a warning box will appear.

c.   Spaces, or blank cells are not allowed. Confirm that all data have been properly entered. If a cell is left blank (with the expectation of column D to G) an error message will be displayed in column V, and in cell Y1. Rows with missing data are not automatically removed from the analysis, so this should be manually corrected by the user.

d.   Blank rows within the data entry area are not allowed. If blank rows are present within the data entry area, an error message will be displayed in cell Y3. Blank data rows within the dataset will lead to an incorrect analysis, so this should be manually corrected by the user.

e. Restricted Numerical Ranges: Please refer to the table above.

f. Additional Restrictions: The Worksheet will allow a maximum input of 3000 cases.

X. Delete Row(s) / Cell(s):

The Data_Input worksheet does not allow the user to delete rows or cells using the normal Excel Select and Delete functions. To delete entered data, the user must use the clear content option.

XI. The Worksheet 'Figures' contains graphs as mentioned above.

In the Worksheet 'Figures' the user can adjust the range of the Postoperative SEQ Numerical Errors that will be analyzed by the spreadsheet. The user can enter a number under E-SD (Cell X22). This number will generate a value by using the following formula (entered number x standard deviation of the numerical errors for each formula). All values outside of this range will be excluded from the analysis. The default value is 4.

This worksheet is not protected, and the user can change their style. Nevertheless, please be aware that this action is not recommended as it might unintentionally disrupt the proper presentation of the data.
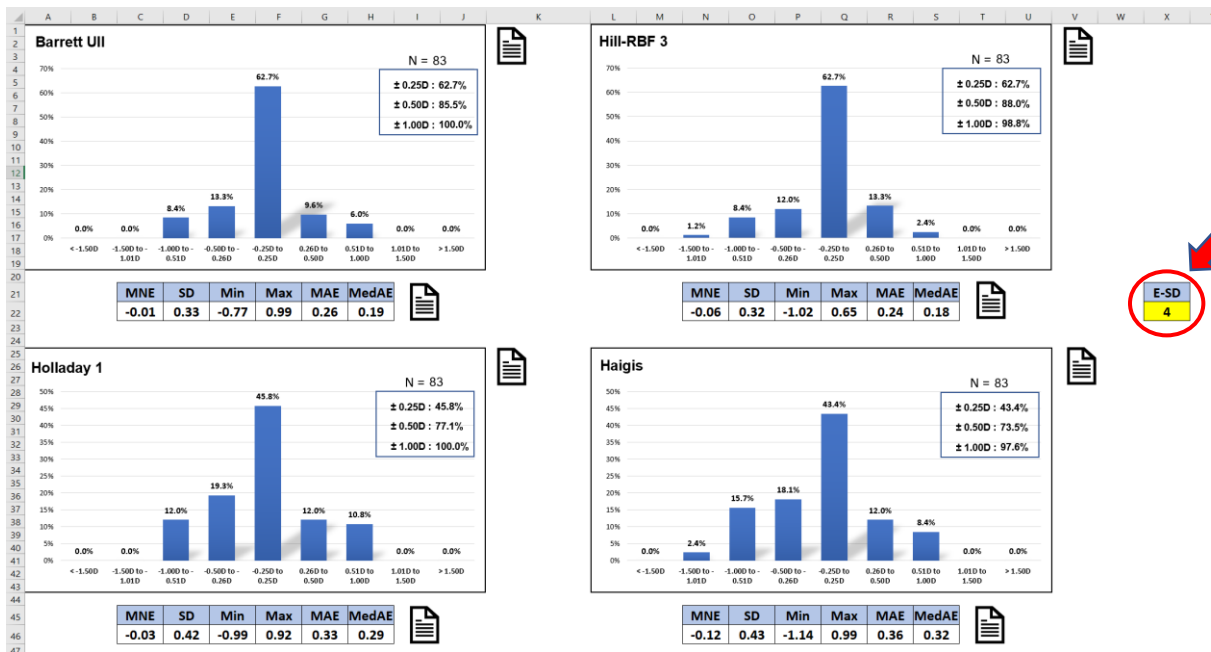
XII. To copy the graphs / tables from the 'Figures' Worksheet, the user can either use the copy icon next to it (this option will not work properly in Office for Mac), or simply select & copy it in a standard way.

MNE	SD	Min	Max	MAE	MedAE
-0.12	0.43	-1.14	0.99	0.36	0.32
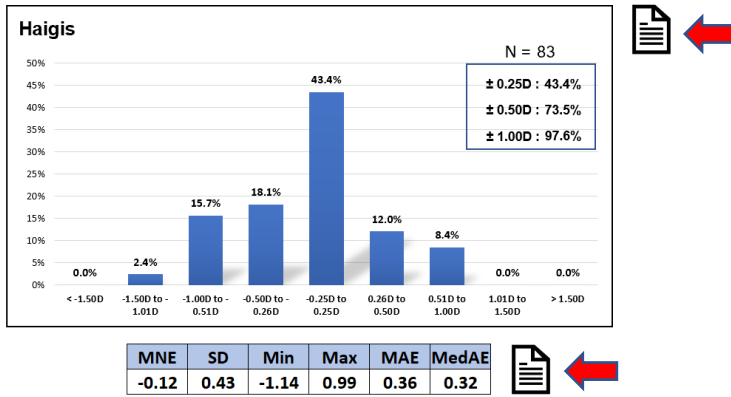
For problems, or specific question, users are welcome to contact:

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End of Excel spreadsheet instructions.