Morphine Milligram Equivalent (MME) Calculator Guide

Background: The NIH HEAL Initiative requires that clinical pain studies monitor use of opioids prescribed for pain management, reported in morphine milligram equivalents (MME). The Morphine Milligram Equivalent Calculator allows researchers to input information into a web tool about the prescription opioids used by study participants, and it will calculate the MME total, and MME per day based on several standardized definitions. Although you are not required to use this calculator specifically, the information represented in this calculator must be included as part of your submission to the HEAL Data Ecosystem. This MME data collection tool is intended as a data resource for research, analytical purposes, and surveillance of population-level medication utilization. It is *not* intended to guide clinical care.

This guide will walk you through the steps of using the calculator.

Example scenario

Jane Smith takes no opioids at study baseline. She has an orthopedic surgery, and receives 30 mg extended-release oxycodone twice a day for 15 days (60 tablets). She also receives a prescription for Tramadol, 100 mg up to 2 times per day as needed for breakthrough pain, for the first 3 post-op days (6 tablets). Both prescriptions were provided on the first day of the month. The study follow-up occurs at 30 days, and revealed no subsequent opioid dispensing.

At baseline, the study team records that the patient did not receive any opioid medications. Nothing else needs to be entered on the baseline MME record.

MME are recorded at the 30 day follow up visit. The study includes the discharge medications and any subsequent refills in this assessment. Because Jane received opioids at hospital discharge, the team decides to use the online MME calculator. Joe, a member of the research team, has reviewed Jane's medical records, and logs into the online MME calculator using their ORCID ID:

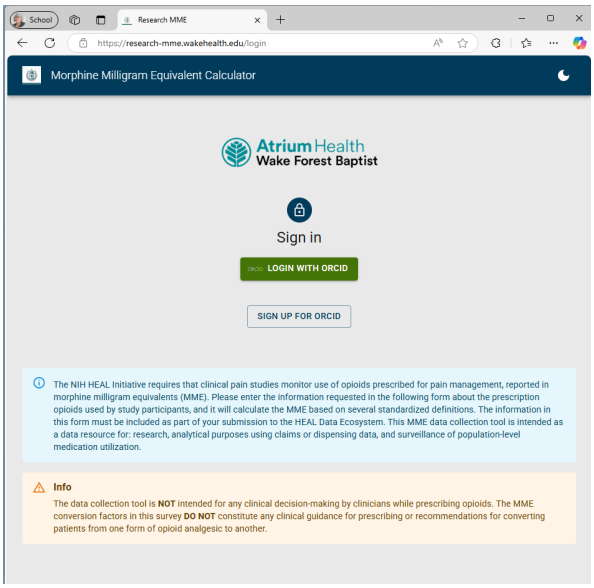
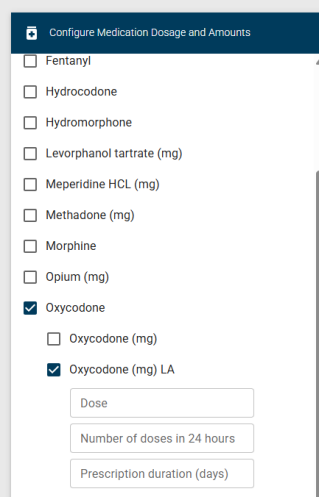


Figure 1 MME online calculator log in screen

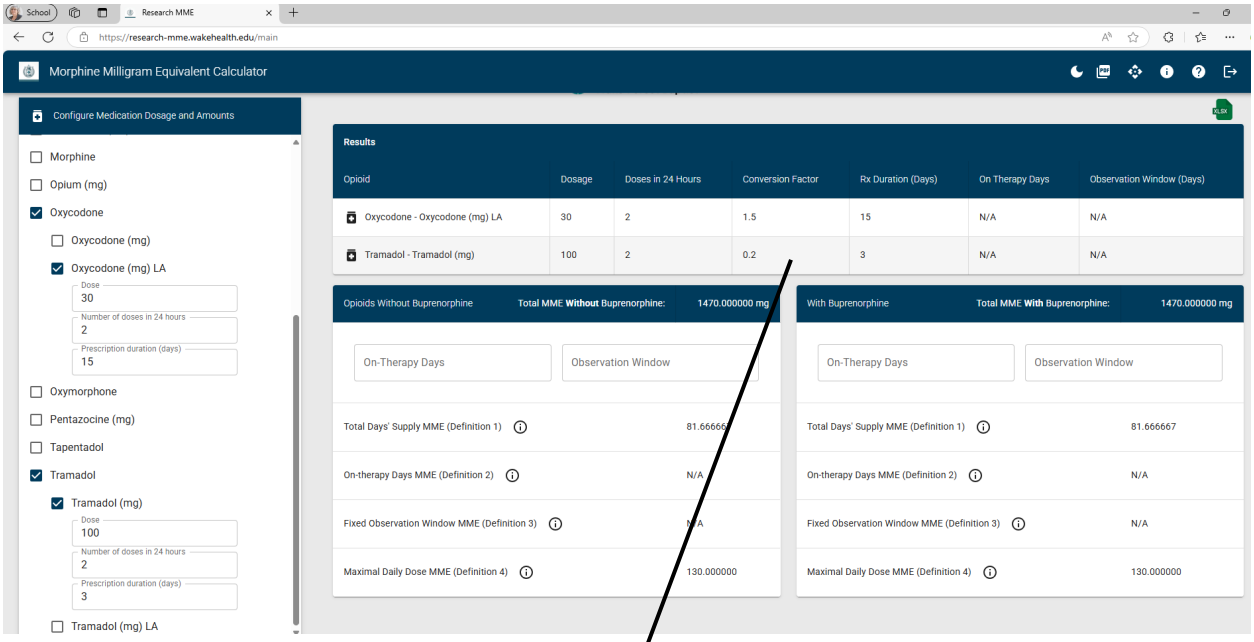
Joe enters the medication prescriptions:



Hint: the conversion factors are the same for short-acting and long-acting medication formulations. If the prescription does not specify short or long acting, you can use either choice and the calculation will be the same.

Figure 2. Medication Entry

Joe enters both prescriptions into the calculator, and sees a summary of the information entered so far.



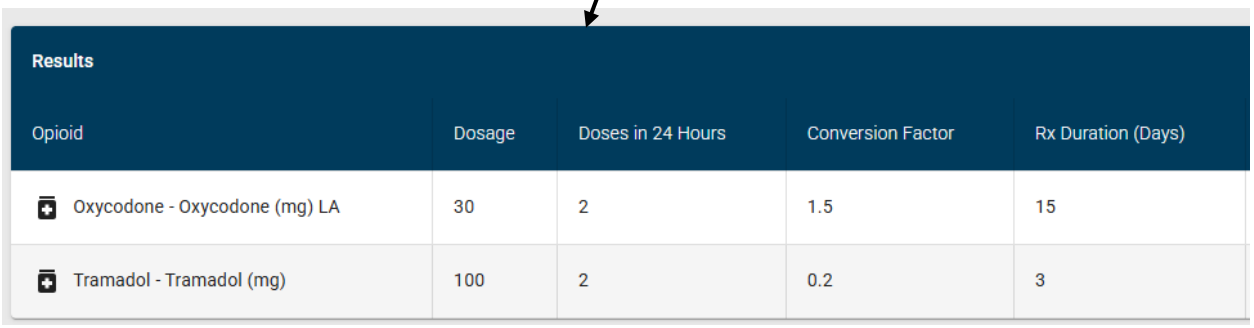


Figure 3 data entered into calculator. Note that oxycodone prescription duration is 15 days, and tramadol duration is 3 days.

Total Days' Supply MME/Day (Definition 1) is calculated, using 15+3 = 18 days as the denominator.

Joe sees from the chart that these medications were both prescribed on the same day - the prescriptions overlap (could have been taken on the same day). Counting the overlap days only once, Joe enters 15 as the “on therapy days” since the longest time Jane could have taken the medications as prescribed is 15 days.

Jane did not receive any buprenorphine for pain relief, so Joe uses the column in the calculator for opioids without buprenorphine.

The study follow up is 30 days, so Joe enters 30 as the observation window.

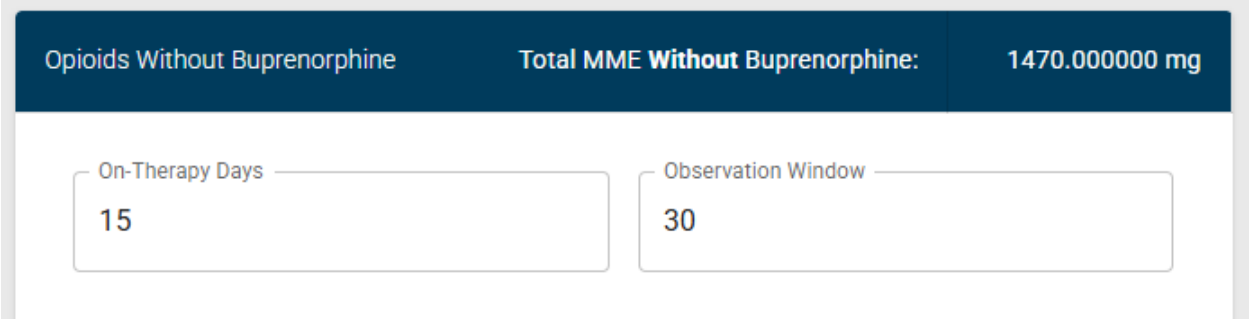


Figure 4 On therapy days and observation window

The calculated **MME per day** for each of the 4 definitions is displayed in the window.

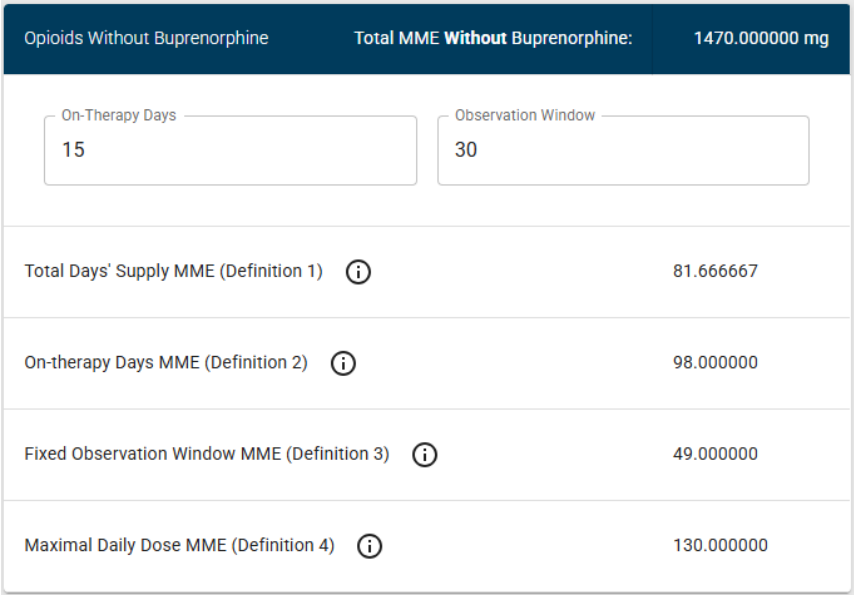
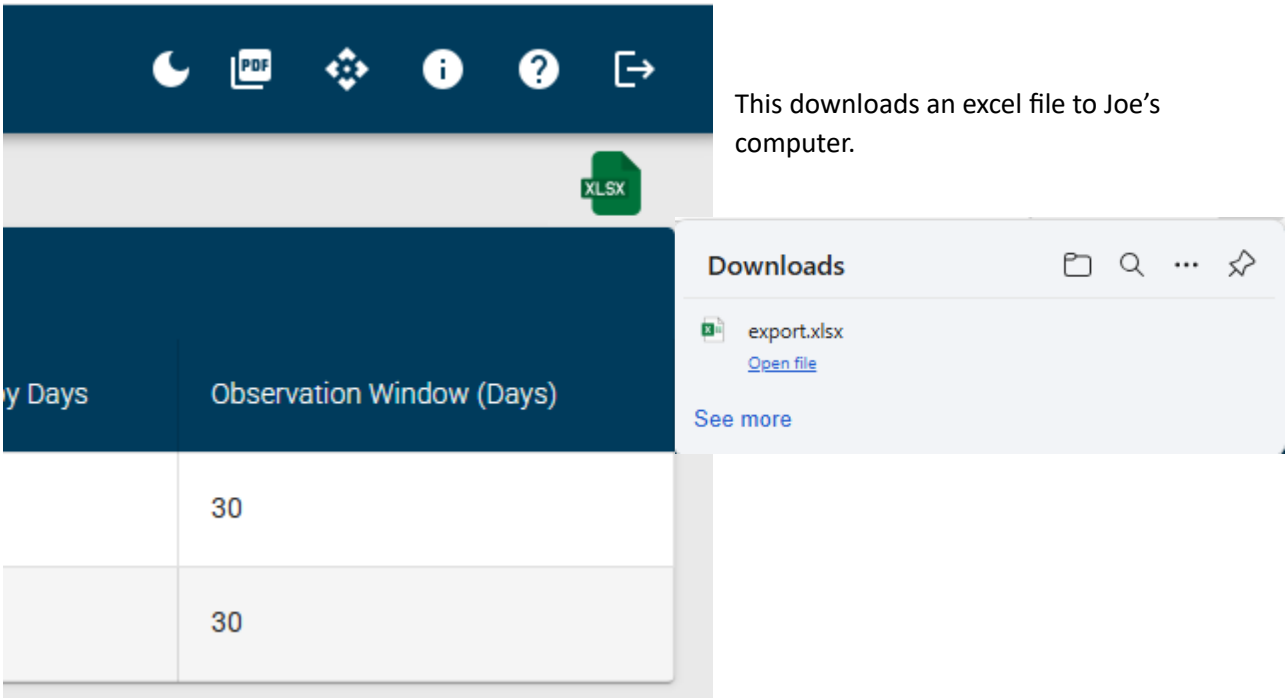


Figure 5 MME per day results

Downloading Results

Data are NOT SAVED in the online calculator. Joe decides to download the information before transcribing the results into the study record. He clicks the “Excel” icon near the upper right side of the screen.



This downloads an excel file to Joe’s computer.

Figure 6 Download Results button

One page of the exported excel file shows the entered data and the total MME exposure for each medication (column F) along with the corresponding CDE variable name (column G).

	A	B	C	D	E	F	G	H	I
1	**Opioid**	**Dosage (mg)**	**Dosage (24 hr)**	**Conversion Factor**	**Prescription Days**	**MME**	**Variable Name**	**Therapy Days**	**Fixed Observation Window Days**
2	Oxycodone - Oxycodone (mg) LA	30	2	1.5	15	1350	mme_oxycodone_mg_la_1.5	15	30
3	Tramadol - Tramadol (mg)	100	2	0.2	3	120	mme_tramadol_mg__0.2	15	30
4									
5									

Figure 7 first page of downloaded file

The second page of the excel file shows the MME per day for the 4 definitions.

Without Buprenorphine	**Therapy Days: 15**	**Fixed Observation Window Days: 30**
MME/Definition 1	81.666667	
MME/Definition 2	98.000000	
MME/Definition 3	49.000000	
MME/Definition 4	130.000000	

Figure 8 Second page of downloaded file

Study Record

In Jane's **baseline** study record, Joe records a "no" response to the first MME question (Is the participant taking an opioid medication for pain management?). The form is marked as completed.

In Jane's **30 day** study record, Joe records the information from the calculator.

Is the participant taking an opioid medication for pain management? YES

Type of medication: Oxycodone and Tramadol are marked as taken.

Amount per dose, number of doses per day, and prescription duration are entered for the two medications.

Joe enters 15 for the on-therapy days, and 30 for the fixed observation window.

The calculated amounts for each of the MME/Day definitions are entered:

Definition 1: 81.67
Definition 2: 98
Definition 3: 49
Definition 4: 130

Note: it is possible with many data capture systems, to upload the data from Excel into the study database. This generally requires reformatting the excel file to a single row (per participant) and renaming columns to correspond to variable names in the study database. For example, here is what the reformatted data might look like for a REDCap database that named variables using the HEAL CDE variable names. (Only relevant portions of the file are shown here).

For the medications – CDE variables ending in "dose" are the amount of medication in a single dose. Variables ending in _24h are the number of doses per day. Variables ending in _rxdur are the duration (number of days) for the prescription.

Variables ending in _mme are the total calculated MME for that medication. (dose * number per day * duration * conversion factor). The sum of these variables is the total MME for the patient (numerator for MME/day definitions 1, 2, and 3).

mme_oxycod_la_dose	mme_oxycod_la_24h	mme_oxycod_la_rxdur	mme_oxycod_mme
30	2	15	1350

mme_tram_dose	mme_tram_24h	mme_tram_rxdur	mme_tram_mme
100	2	3	120

Figure 9 data for entered medications with HEAL variable names

The variable names for the calculations are shown below. A row has been added explaining each.

mme_sum_allrx_mme	mme_sum_rxdur	mme_on_therapy_days	mme_fixed_observation
Sum of the exposures for all medications (total oxycodone + total tramadol). This is the numerator for MME/Day definitions 1, 2, and 3	Sum of the prescription durations. Denominator for definition 1	On therapy days. Denominator for definition 2	Fixed observation window. Denominator for definition 3
1470	18	15	30

mme_total_days_supply	mme_total_mme_on_ther	mme_total_fixed_observ	mme_max_daily_dose
Calculated MME/day for definition 1 (total days supply)	Calculated MME/day for definition 2 (on therapy days)	Calculated MME/day for definition 3 (fixed observation window)	Calculated MME for a day on which both medications were taken (definition 4)
81.67	98	49	130

Figure 10 Calculation columns in the exported file

Why are the calculated values so different? *It's because the total amount of medication exposed is spread across a different number of days.*

Definition 1 is 1470 divided among 18 days = 81.67

Definition 2 is 1470 divided among 15 days = 98

Definition 3 is 1470 divided among 30 days = 49

*Definition 4 calculates the 24 hour MME exposure for each medication (dose * number of doses per day * conversion factor) and adds them, assuming both medications were taken on the same day.*

The conversion factor for oxycodone is 1.5. MME for one day for oxycodone is

*30 (mg) * 2 (times per day) * 1.5 (conversion factor) = 90*

The conversion factor for tramadol is 0.2. MME for one day for tramadol is

*100 (mg) * 2 (times per day) * 0.2 = 40*

Summed: 90 + 40 = 130