

First Year Standardized Waitlist Ratio (FYSWR) Measure Calculation Description

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Introduction

The *First Year Standardized Waitlist Ratio (FYSWR) Measure Calculation Description* serves as a complementary document to the *Quality ID #510: First Year Standardized Waitlist Ratio (FYSWR) Measure Specification Form* to aid in the calculation of the FYSWR. These technical notes describe the statistical methods used to calculate the measure, including model details, and can be found on the following publicly available webpage:

<https://dialysisdata.org/content/MIPS>. The model details have already been calculated by the measure developer and are provided to Merit-based Incentive Payment System (MIPS) eligible clinician groups calculating the measure.

Measure Description

The First Year Standardized Waitlist Ratio (FYSWR) measures the number of incident (newly initiated on dialysis) patients in a practitioner (inclusive of physicians and advanced practice providers) group who are under the age of 75, and were listed on the kidney or kidney-pancreas transplant waitlist or received a living donor transplant within the first year of initiating dialysis.

The measure is defined as the ratio of the observed number of waitlist events in a practitioner group to the model-based expected number of waitlist events. Specifically, the numerator is the number of observed waitlist events in a practitioner group. The denominator is the number of expected waitlist events in a practitioner group. Here the expected waitlist events are calculated from a Cox model, adjusting for age, patient comorbidities, and other risk factors at incidence of dialysis, and assuming the practitioner group-specific event rate equals the population average.

In this measure, each practitioner group is compared with an “average” group in the population of all practitioner groups. An FYSWR lower than 1 indicates that the practitioner group’s observed waitlist rate is less than expected based on national rates. An FYSWR greater than 1 indicates that the practitioner group has a rate of waitlist events higher than expected, based on patient characteristics and the national rates.

Numerator

Patients in the practitioner group’s denominator listed on the kidney or kidney-pancreas transplant waitlist or who received living donor transplants within the first year following initiation of dialysis.

Denominator

The denominator for the FYSWR is the expected number of waitlist or living donor transplant events in the practitioner group according to each patient's treatment history for patients within the first year following initiation of dialysis, adjusted for age, incident comorbidities, dual

Medicare-Medicaid eligibility, Area Deprivation Index (from patient's residence zip code)¹, and transplant center characteristics, among patients under 75 years of age who were not already waitlisted and did not have kidney transplantation prior to the initiation of end-stage renal disease (ESRD) dialysis. The number of days at risk (time from start of dialysis to the earliest of being placed on the waitlist, receiving a living donor transplant, death, or one year from start of dialysis) for each patient is used to calculate the expected waitlist or living donor transplant events.

Patient characteristics included in the model as covariate variables are:

- Age at incidence of ESRD dialysis
 - Age is included as continuous variable as well as age spline knots at 12, 18, and 64. For example, patients older than 64 will have all four splines (Age, Age-12, Age-18 and Age-64). In contrast, patients older than 18 but younger than 64 will only have three spline (Age, Age-12, and Age-18).
- Comorbidities at ESRD incidence (from CMS Medical Evidence Form 2728 Box 16):
 - Heart disease (congestive heart failure, atherosclerotic heart disease and other cardiac disease)
 - Cerebrovascular disease, CVA, TIA
 - Peripheral vascular disease
 - Chronic obstructive pulmonary disease
 - Inability to ambulate
 - Inability to transfer
 - Malignant neoplasm, cancer
 - Drug dependence
 - Amputation
 - Assistance with daily activities
- Medicare-Medicaid dual eligibility
- Area Deprivation Index (ADI), based on patient residence zip code
- Transplant center characteristics, based on patient residence zip code
 - Weighted SRTR mortality ratio
 - Weighted SRTR transplant ratio

¹ For ADI description and data download please refer to <https://www.neighborhoodatlas.medicine.wisc.edu/>. These data are included in the Excel file at <https://dialysisdata.org/content/MIPS>.

Patient Exclusions

Patients who were at age 75 or older on their initiation of dialysis date are excluded. Patients who were admitted to a skilled nursing home facility (SNF) or a hospice at incidence of ESRD dialysis were excluded. These exclusions represent conditions for which transplant waitlist candidacy is highly unlikely and which can be identified readily with available data. Patients were also excluded if waitlisted or transplanted prior to initiation of first dialysis.

Calculation of the FYSWR

In order to calculate the FYSWR, you will need (1) information on your patients events (first date of ESRD, waitlist date, living donor transplant date, and/or death date) in order to calculate the number of days at risk, (2) information on your patients' characteristics that are described above (age, comorbidities, Medicare dual eligibility status (i.e. whether the patient have both Medicare and Medicaid coverage), and zip code) which can be found on the CMS Medical Evidence Form 2728, and (3) to download the *FYSWR_ModelInfo.xlsx* spreadsheet. With this information you will be able to do the mathematical calculation for each patient as described above.

The *FYSWR_ModelInfo.xlsx* spreadsheet includes the following information: **Model Coefficients**, **Baseline Cumulative Hazard**, and **Txp Center & ADI by Zip Code**. For the purposes of this document, each reference to these model details sheets will be described in **bold** text. A [calculation example](#) is provided.

The **Model Coefficients** sheet details the FYSWR model coefficients' parameter, variable type, and estimate. For example, the "Cancer" parameter is listed as "Categorical (0 versus 1)" with an estimate of -0.5455 (rounded).

The **Baseline Cumulative Hazard** sheet provides a hazard value for each day at risk in a year, numbered 0 to 365.

The **Txp Center & ADI by Zip Code** sheet provides the values for the two transplant center effects, Weighted SRTR mortality ratio and Weighted SRTR transplant ratio, as well as Area Deprivation Index ADI by Zip code. For example, Zip Code "00601" uses the following values (rounded): a Weighted SRTR mortality ratio of 1.0849, a Weighted SRTR transplant ratio of 0.9407, and an ADI of 85.4989.

As an example, we calculate the FYSWR for a hypothetical practitioner group that treated 12 patients. Patients #2, #4, and #7 were placed on the waitlist during the time period. Patient #3 and #10 received a living donor transplant. Table 1 describes the patients and their history of treatment. Characteristics are omitted for 8 patients for space.

For this practitioner group:

Step 1: Calculate days at risk. Days at risk is calculated as the time between the start of ESRD and date of listing on the kidney or kidney-pancreas transplant waitlist; date of receiving a living donor transplant; date of death; or 365 days after the start of ESRD dialysis treatment, whichever comes first.

Table 1. Description of 4 patients at a hypothetical practitioner group for the FYSWR calculation

Patient <i>i</i>	Start of ESRD	End date (event)	Days at risk	Characteristics*
#1	1/1/2022	12/31/2022 (one year from start)	365	Age=73; comorbidities in 2728: cancer, PVA; non Medicare dual eligibility; zip code=49727.
#2	5/23/2022	10/11/2022 (waitlisted)	141	Age=48; comorbidities in 2728: none; non Medicare dual eligibility; zip code=49762
#3	7/28/2021	2/28/2022 (transplant)	215	Age=64; comorbidities in 2728: PVA; non Medicare dual eligibility; zip code=49712
#4 - #11	<i>(omitted)</i>	<i>(omitted)</i>	<i>(omitted)</i>	<i>(omitted)</i>
#12	5/22/2021	1/16/2022 (death)	239	Age=67; comorbidities in 2728: Heart Disease; non Medicare dual eligibility; zip code=49727.

*Comorbidities and Medicare dual eligibility are coded as "1" if present, otherwise "0" for not present or unknown; Unknown zip codes are referred to row "unknown" for the corresponding transplant center effects and ADI in the Excel file.

Step 2: For each patient period, calculate the linear prediction using the **Model Coefficients** table in the *FYSWR_ModelInfo.xlsx* Excel file located at <https://dialysisdata.org/content/MIPS>. Table 2 shows these details for the example. Note the calculations can be affected by rounding. For this calculation example, we show only four decimal places for ease of display.

Table 2. Calculation of the linear prediction for each patient period

Patient <i>i</i>	Linear prediction calculation	Resulting linear prediction
#1	$(\text{Age}=73)*0.0978+(73-12)*(-0.1998)+(73-18)*0.0716+(73-64)*(-0.0846)+(\text{cancer}=1)*(-0.5455)+(\text{PVA}=1)*(-0.4015)+(\text{ADI}=73.2484)*(-0.0138)+(\text{mort ratio}=0.8840)*(0.3316)+(\text{tx ratio}=1.0384)*(0.0372)$	-3.55
#2	$(\text{Age}=48)*0.0978+(48-12)*(-0.1998)+(48-18)*0.0716+(\text{ADI}=81.3101)*(-0.0138)+(\text{mort ratio}=0.9529)*(0.3316)+(\text{tx ratio}=1.1670)*(0.0372)$	-1.12
#3	$(\text{Age}=64)*0.0978+(64-12)*(-0.1998)+(64-18)*0.0716+(64-64)*(-0.0846)+(\text{PVA}=1)*(-0.4015)+(\text{ADI}=59.8046)*(-0.0138)+(\text{mort ratio}=0.9816)*(0.3316)+(\text{tx ratio}=1.1659)*(0.0372)$	-1.71
#4 - #11	<i>(omitted)</i>	<i>(omitted)</i>
#12	$(\text{Age}=67)*0.0978+(67-12)*(-0.1998)+(67-18)*0.0716+(67-64)*(-0.0846)+(\text{CVD}=1)*(-0.5996)+(\text{ADI}=73.2485)*(-0.0138)+(\text{mort ratio}=0.8840)*(0.3316)+(\text{tx ratio}=1.0384)*(0.0372)$	-2.53

Step 3: Use the Excel file to find the baseline cumulative hazard, by finding the corresponding hazard value given the number of days at risk in the patient period. Table 3 shows these details for the example. Again, note the baseline cumulative hazard values are shown to four decimal places in this example.

Table 3. Baseline cumulative hazard values for each patient

Patient <i>i</i>	Days at risk	Baseline cumulative hazard
#1	365	0.4328
#2	141	0.1306
#3	215	0.2266
#4 - #11	<i>(omitted)</i>	<i>(omitted)</i>
#12	239	0.2608

Step 4: Using the linear prediction and baseline cumulative hazard in Tables 2 and 3, compute the expected number of waitlists for each of these patients by calculating the exponentiation of the linear prediction and multiplying by the baseline cumulative hazard.

The expected number of waitlists of a patient is calculated as:

$$\begin{aligned} \text{Expected number of waitlists} \\ &= \exp(\text{Linear prediction}) * (\text{Baseline cumulative hazard}) \end{aligned}$$

Tables 4 shows the calculation of the expected number of waitlists for each patient.

Table 4. Calculation of the expected number of waitlists for each patient

Patient <i>i</i>	Linear prediction	exp(linear prediction)	Baseline cumulative hazard	Expected number of waitlist events
#1	-3.55	0.0287	0.4328	0.0124
#2	-1.12	0.3262	0.1306	0.0426
#3	-1.71	0.1797	0.2266	0.0407
#4 - #11	(omitted)	(omitted)	(omitted)	(omitted)
#12	-2.53	0.0795	0.2608	0.0207

Step 5: Calculate the total expected number of waitlists by adding each patient's expected number of waitlists for all the patients from Table 4:

$$\text{Total expected number of waitlists} = 0.0124 + 0.0426 + 0.0407 + \dots + 0.0207$$

Step 6: Finally, calculate FYSWR by dividing the total number of observed events (waitlists or living donor transplants) by the total number of expected waitlists. Since there were 3 patients that were placed on the kidney transplant waitlist and 2 patients that received a living donor transplant, for this practitioner group. The sum of the expected is 4.46.

$$\begin{aligned} \text{FYSWR} &= \frac{\text{Sum observed waitlists}}{\text{Sum expected waitlists}} \\ &= \frac{3 + 2}{0.0124 + 0.0426 + 0.0407 + \dots + 0.0207} = \frac{5}{4.46} = \mathbf{1.12} \end{aligned}$$