

# Tara Pande – Milestone 1

Wednesday, July 23, 2025 3:22 PM

**Project Title:** Retrospectively investigating the 5-year recurrence rate of papillary thyroid carcinoma in patients prescribed Levothyroxine.

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## PURPOSE OF STUDY

### **How is Levothyroxine used (e.g., treat condition, post operation)?**

- After a total thyroid removal surgery (thyroidectomy), Levothyroxine is used to replace the natural T4 hormone originally produced by the thyroid gland. It is a drug that requires very personalizing dosing (which can take months to determine) as too much can cause hyperthyroidism and too little can cause hypothyroidism. Ultimately, Levothyroxine makes sure that there is enough thyroid hormone in the body so that the pituitary gland makes less TSH. Suppressing TSH slows the growth of any remaining thyroid cancer cells, and ultimately reduces the recurrence rate of papillary thyroid carcinoma. PTC is the most common type of thyroid cancer and Levothyroxine is one of the most common thyroid cancer medications.

### **What would qualify a patient for the drug?**

- A patient would be qualified for the drug if they have a confirmed diagnosis of papillary thyroid carcinoma (PTC), often have a documented thyroidectomy due to their PTC (although not always), and are over the age of 18.

### **What outcome is used to evaluate the drug's effectiveness?**

- Common clinical endpoints for Levothyroxine effectiveness are recurrence-free survival, disease-free survival, or overall survival. You can also measure TSH levels or perform neck ultrasounds (to try and spot any more cancer) to evaluate Levothyroxine's effectiveness.

## COHORT DEFINITION

### **Cohort Entry**

- A condition of Papillary Thyroid Carcinoma (CC: 255029007) with continuous observation of at least 0 days before and 720 days after event index date
- Restrict initial events to having all of the following criteria:
  - With age greater of equal to 18
  - With at least 1 occurrence of a procedure occurrence of Thyroidectomy (CC: 13619001) where event starts between 0 days before and all days after index start date

### **Inclusion Criteria**

- At least 1 occurrence of a drug exposure of Levothyroxine (CC: 10582) where event starts between all days before and all days after index start date

### **Cohort Exit**

- Event will persist until end of continuous observation.

**TABLE 1.** Demographics of Papillary Thyroid Carcinoma Patients (who received a thyroidectomy) Eligible and/or Receiving Levothyroxine

Demographics	Papillary Thyroid Carcinoma (PTC) Patient (n=1645)	PTC Patient Receiving Levothyroxine (n=1501)	PTC Patient NOT Receiving Levothyroxine (n=144)
<b>Race</b>			
White	915 (55.62%)	836 (55.70%)	79 (54.86%)
Asian	383 (23.28%)	352 (23.45%)	31 (21.53%)
Black	34 (2.07%)	31 (2.07%)	3 (2.08%)
Other	254 (15.44%)	228 (15.19%)	26 (18.06%)
Unknown	39 (2.37%)	34 (2.27%)	5 (3.47%)
<b>Ethnicity</b>			
Hispanic/Latino	274 (16.66%)	251 (16.72%)	23 (15.97%)
Not His/Lat	1328 (80.73%)	1211 (80.68%)	117 (81.25%)
<b>Sex</b>			

**TABLE 2 (FOR BONUS).** Recurrence Rate (5 years later) of Papillary Thyroid Carc Patients (who received a thyroidectomy) Eligible and/or Receiving Levothyroxine

Demographics	Papillary Thyroid Carcinoma (PTC) Patient (n=1645)	PTC Patient With Recurring Cancer (n = 297)	PTC Patient V Recurring Car Receiving Levothyroxin (n=288)
<b>Race</b>			
White	915 (55.62%)	167 (56.23%)	161 (55.90%)
Asian	383 (23.28%)	75 (25.25%)	74 (25.69%)
Black	34 (2.07%)	4 (1.35%)	4 (1.39%)
Other	254 (15.44%)	48 (16.16%)	46 (15.97%)
Unknown	39 (2.37%)	1 (0.34%)	1 (0.35%)
<b>Ethnicity</b>			
Hispanic/Latino	274 (16.66%)	43 (14.48%)	42 (14.58%)
Not His/Lat	1328 (80.73%)	250 (84.18%)	243 (84.38%)
<b>Sex</b>			

Female	1158 (70.40%)	1059 (70.55%)	99 (68.75%)
Male	486 (29.54%)	442 (29.45%)	44 (30.56%)
<b>Age</b>			
Average	48.34	48.09	50.92
Median	47.00	47.00	48.00
Std Dev	15.31	15.33	14.85

Table 1 Source - My Atlas Characterization Results

Female	1158 (70.40%)	208 (70.03%)	204 (70.83%)
Male	486 (29.54%)	88 (29.63%)	84 (29.17%)
<b>Age</b>			
Average	48.34	47.00	47.16
Median	47.00	46.00	46.00
Std Dev	15.31	13.98	13.86

Table 2 Sources: Cohort #345 and Characterization #117

**BONUS:**

- **Chi-square & Fisher's Exact Test: Recurrence vs. Levothyroxine Use**
  - Chi2: 14.00, p-value: 0.0002
  - Fisher's Exact Test p-value: 0.0000, Odds Ratio: 3.56
  - Statistically significant association between levothyroxine use and recurrence
  - Patients taking Levothyroxine had 3.56 times higher odds of recurrence than those not taking it. This may be because patients prescribed with Levothyroxine are inherently more likely to experience recurrence, meaning severity/risk could be an unaccounted for confounding variable. This is a great example about how easy it is for confounding variables to slip in. My intuition tells me that it wouldn't make sense for levothyroxine to causally increase recurrence given its role as a TSH suppressor (which slows/stops growth of any remaining thyroid cancer cells after thyroidectomy).
- **Welch's t-test: Age Difference Between Levothyroxine Groups**
  - t = -2.1782
  - df = 173.56
  - p-value = 0.03074
  - Statistically significant difference in average age: Levothyroxine users were younger on average (since t is negative)
- **Chi-square: Sex vs. Recurrence**
  - Sex vs. Recurrence: p = 1.0000
  - No statistically significant association between sex and recurrence

My code for the bonus statistical analysis:



206-m1

Component	Your Score	Albert Score	Points	Additional Justification (if needed)	Comments from Albert
There is a page in Project Milestone 1 Submissions of this notebook, and it includes a project title and your name.	1		1		
The page adequately describe the purpose of your study.	3		3		
The page adequately describe the cohort definition.	3		3		
The page includes a table 1 for the cohort within UCSF	3		3		
Bonus – The page includes the results from completing the bonus.	5		5		
<b>Total</b>	<b>15</b>		<b>10</b>		

