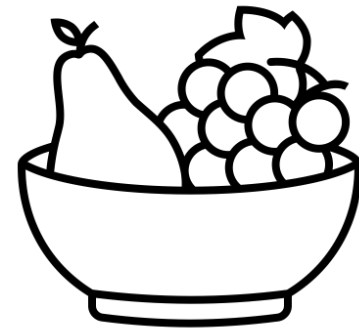
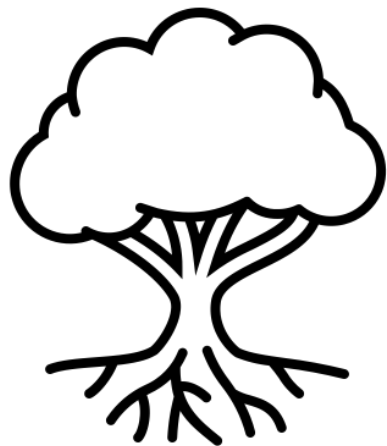




Chemistry of Dementia Risk Factors & Community Based Prevention

PGAEF Fellow Taylor Tomlinson

4th Year Ph.D Candidate in Chemistry

Netter Center UACS National Network Convening

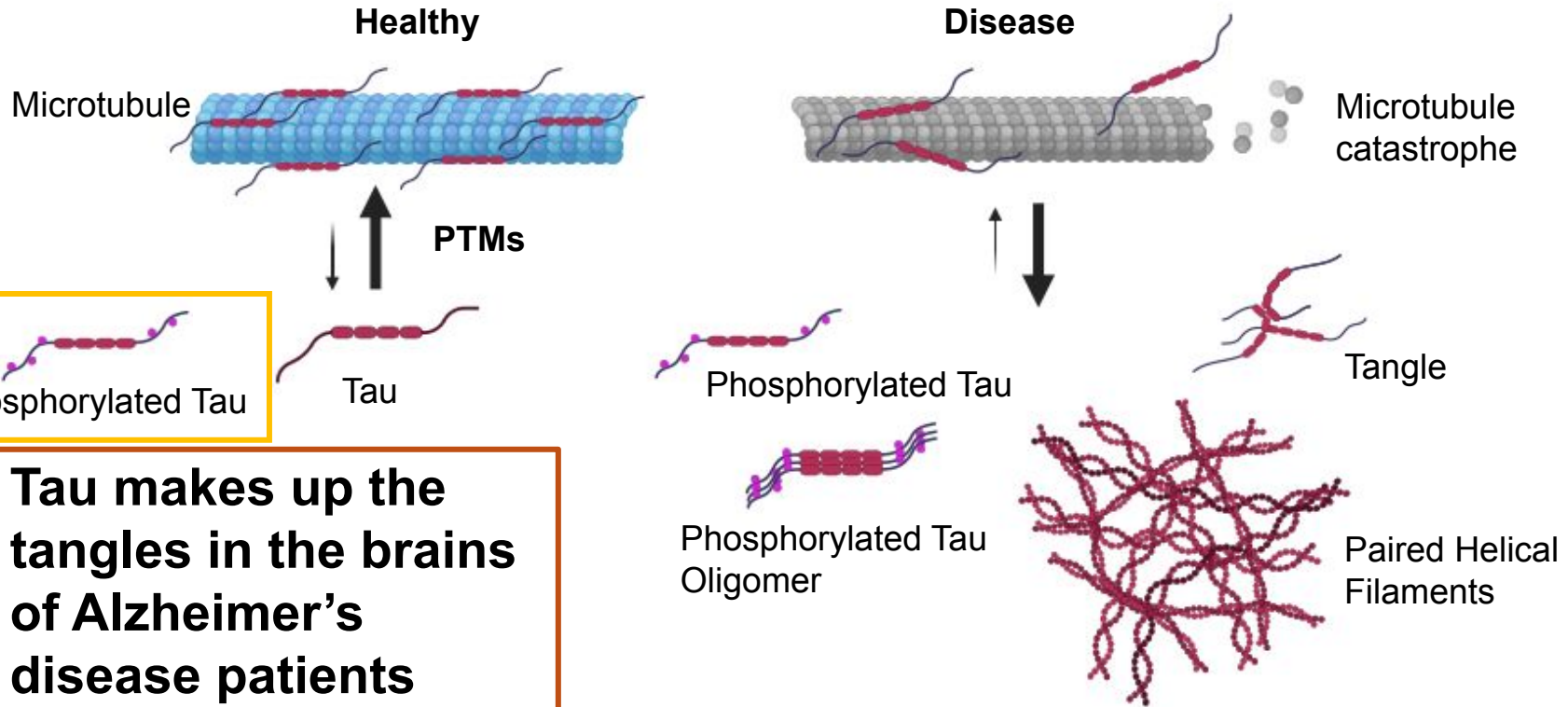
January 20, 2025

A little about me:

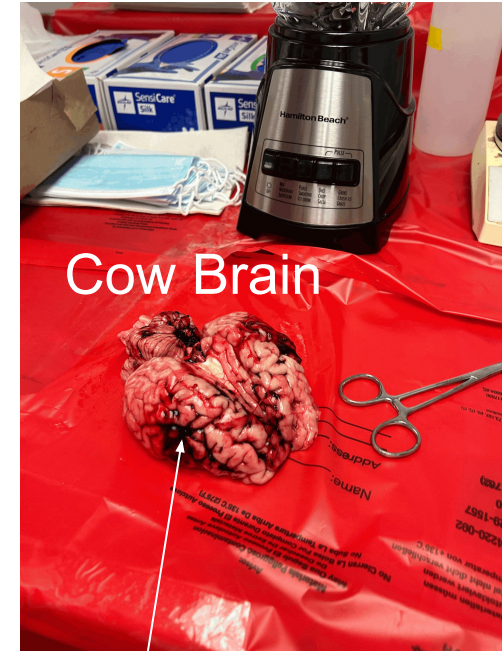
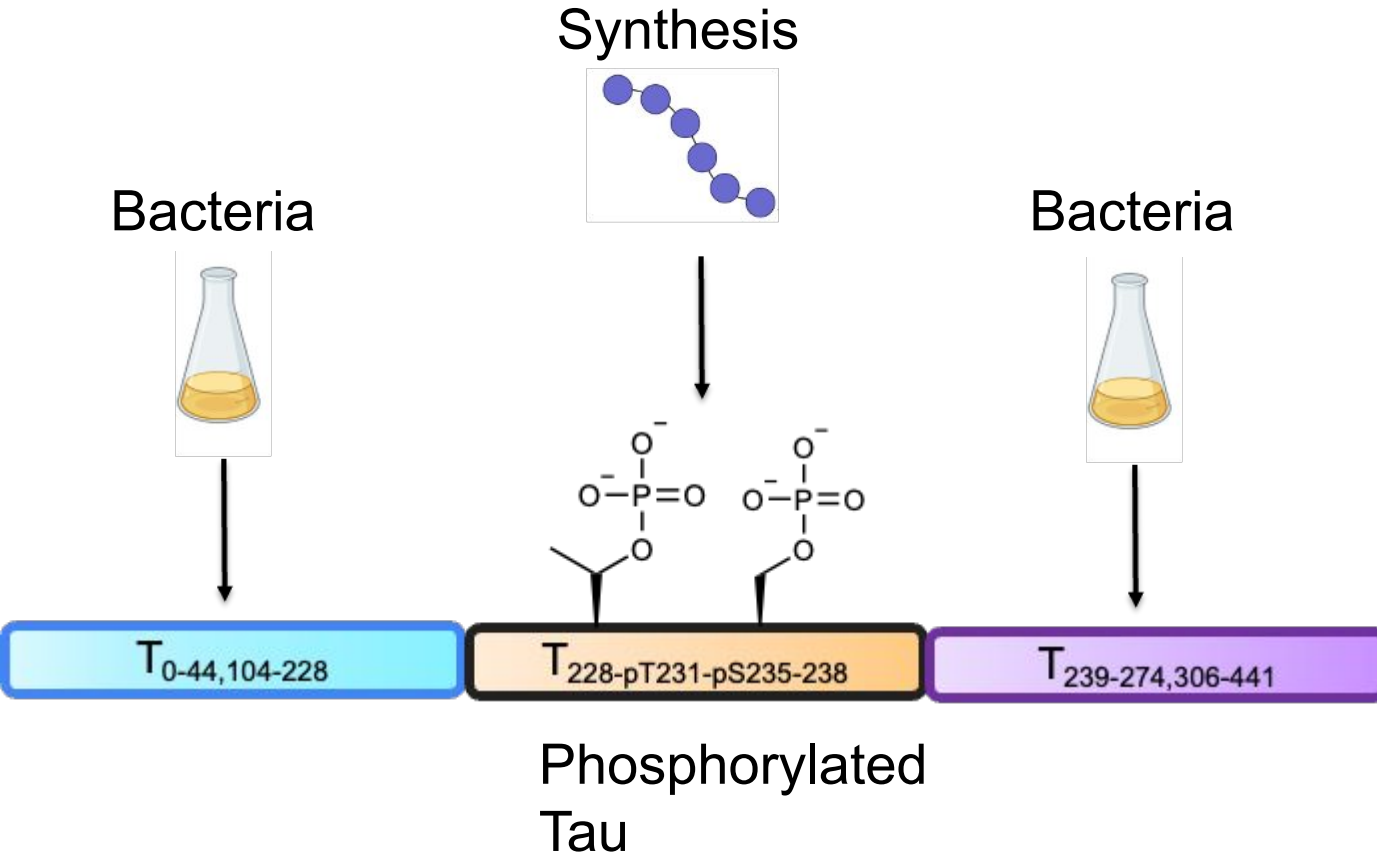
University of Pittsburgh 2022
B.S Chemistry
B.A Sociology

University of Pennsylvania
4th Year Ph.D Candidate in Chemistry
PGAEF Fellow 2024-2026

Tau is an intrinsically disordered protein, which stabilizes microtubules in a dynamic equilibrium



Methods to obtain **Phosphorylated Tau** and **Tubulin**

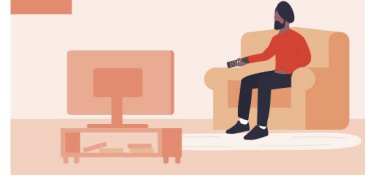


Tubulin

Science we do in the lab
doesn't necessarily get
used to help people in the
real world – sometimes
even misused

14 dementia risk factors

1 Physical inactivity



2 Smoking



3 Excessive alcohol consumption



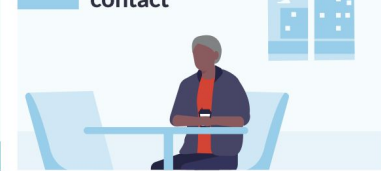
4 Air pollution



5 Head injury



6 Infrequent social contact



7 Less education



8 Obesity



9 Hypertension



10 Diabetes



11 Depression



12 Hearing impairment

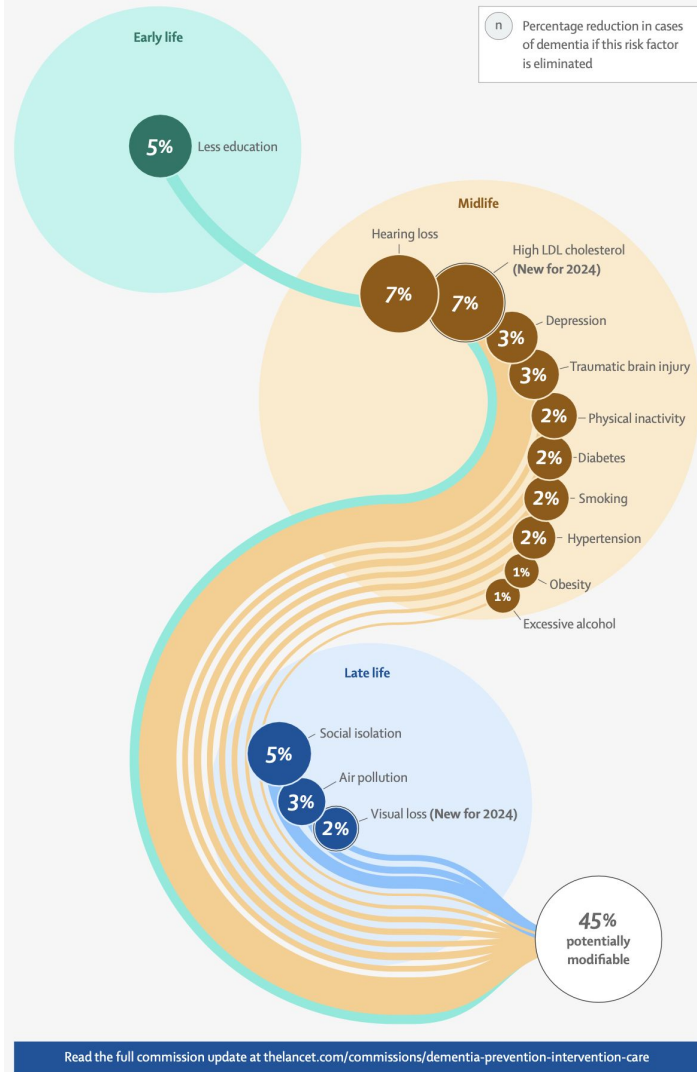


13 High LDL cholesterol



14 Vision loss





• Up to **45%** of all dementia cases could be delayed or prevented

We cannot eliminate the
risk of dementia, **but we**
can lower the risk

CLOSE TO HOME:

The Health of Philadelphia's Neighborhoods

2019 Report of 46 Philadelphia Neighborhoods



Life expectancy determined by zip code

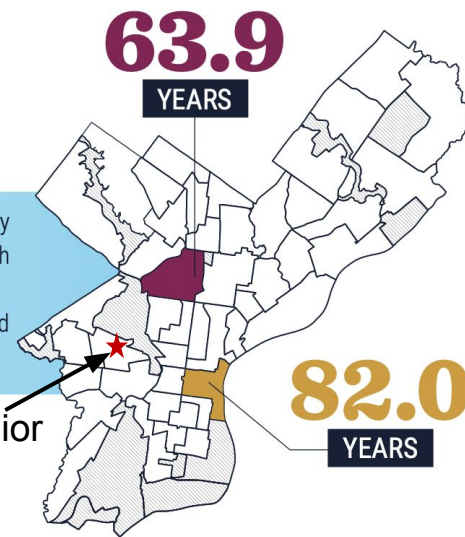
INTRODUCTION

Despite overall progress in recent years, Philadelphia's health significantly lags behind other major cities. For example, among counties that contain the nation's largest cities, Philadelphia has the highest rates of premature death, infant and child mortality, cardiovascular disease, hypertension, HIV, and homicide. Underlying these poor health outcomes are also high rates of behavioral and economic determinants, including smoking, poverty, single parent households, housing-cost burden, and low education.

These poor outcomes are not experienced across all communities in Philadelphia.

Living just a few miles away can decrease life expectancy by nearly twenty years. Many Philadelphians live, learn, work, shop, and play in neighborhoods that make good health difficult to achieve. These contextual factors mediate genetic determinants of health and shape health behaviors. Ultimately, contextual factors both explain poor health and point toward potential solutions.

West Philadelphia Senior
Community Center



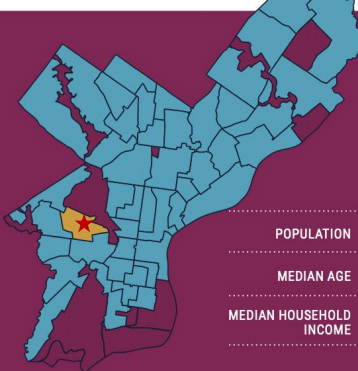
Mill Creek-Parkside

HEALTH
OUTCOMES
RANK

43/46

HEALTH
FACTORS
RANK

39/46



POPULATION **33,549**

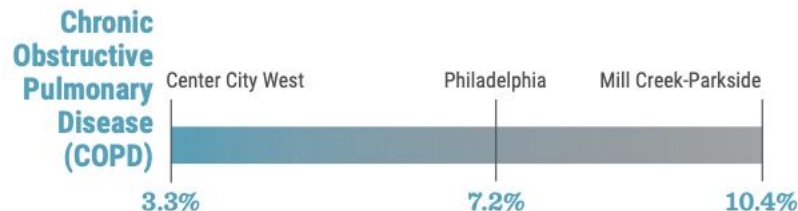
MEDIAN AGE **32.2**

MEDIAN HOUSEHOLD
INCOME **\$19,822**

HEALTH OUTCOMES

Length of Life	Mill Creek-Parkside		Philadelphia
	Quartile Ranking	Data	
Life Expectancy, Men	★☆☆☆	67.7	72.3
Life Expectancy, Women	★☆☆☆	75.1	79.3
Quality of Life			
★ Poor Physical Health	★☆☆☆	20.8%	13.7%
★ Poor Mental Health	★☆☆☆	20.0%	14.6%
Low Birth Weight	★☆☆☆	14.3%	10.8%
Adult Asthma	★☆☆☆	14.7%	10.9%
★ Hypertension	★☆☆☆	44.7%	32.9%
★ High Cholesterol	★☆☆☆	38.4%	34.6%
Cancer	★★★★	5.4%	5.6%
Chronic Kidney Disease	★☆☆☆	4.0%	3.0%
Chronic Obstructive Pulmonary Disease (COPD)	★☆☆☆	10.4%	7.2%
Coronary Heart Disease	★☆☆☆	8.5%	6.3%
★ Diabetes	★☆☆☆	19.5%	12.2%
Stroke	★☆☆☆	6.7%	4.0%

Mill Creek-Parkside Health Outcomes



Mill Creek-Parkside Health Factors



To change the **outcomes**, we have to change the **input**

HEALTH FACTORS

Health Behaviors		Mill Creek-Parkside		Philadelphia
		Quartile Ranking	Data	
Tobacco Use	★ Adult Smoking	☆☆☆☆	32.4%	22.2%
	★ Diet & Exercise	☆☆☆☆	44.0%	30.6%
	Residents >½ mile from Supermarket	☆☆☆☆	14.6%	22.3%
	Physically Inactive Adults	☆☆☆☆	37.9%	30.6%
	★ Alcohol & Drug Use	★★★★	13.5%	17.9%
	Drug Overdose Deaths (per 100,000 people)	☆☆☆☆	57.4	44.8
	Sexual Activity	☆☆☆☆	23.3	26.0
	Teen Births (per 1,000 females 15-19)	☆☆☆☆	23.3	26.0
Clinical Care				
Access to Care	Uninsured	★★★★	11.4%	12.0%
	Primary Care Physician Supply (residents per physician)	★★★★	907.1	1460
	Inadequate Prenatal Care	☆☆☆☆	41.0%	30.7%
	Recent Routine Medical Checkup, Adults	★★★★	75.8%	74.9%
Quality of Care	★ Core Preventive Services, Men 65+	☆☆☆☆	20.9%	29.0%
	★ Core Preventive Services, Women 65+	☆☆☆☆	20.0%	28.7%
	Mammography Screening	★★★★	78.6%	79.2%
	Hypertension Medication Adherence	★★★★	82.7%	76.4%
Social & Economic Factors				
Education	★ Reading Proficiency (K-2)	☆☆☆☆	43.0%	45.0%
	Completed Some College	☆☆☆☆	42.6%	49.1%
Employment	Unemployment	☆☆☆☆	16.8%	12.5%
Income	Children in Poverty	☆☆☆☆	60.1%	36.7%
	Income Inequality	☆☆☆☆	-0.40	-0.06
Family & Social Support	Single Parent Households	☆☆☆☆	27.7%	15.8%
Community Safety	Violent Crime (per 10,000 people)	☆☆☆☆	168.1	95.7
	Injury Deaths (per 100,000 people)	☆☆☆☆	72.4	68.6
	Homicides (per 10,000 people)	☆☆☆☆	3.6	1.7
Physical Environment				
Housing & Transit	★ Housing Code Violations (per 1,000 housing units)	☆☆☆☆	905.1	164.1
	Driving Alone to Work	★★★★	35.8%	50.8%
	Commute ≥ 60 Minutes	★★★★	23.0%	14.1%
	Walk Score™	★★★★	84.8	79.0
	★ Vacant Buildings	☆☆☆☆	4.8%	2.4%



CHEM 0150 Chemistry of Dementia Risk Factors and Community-Based Prevention

- 1 credit **ABCS** course; offered in Spring 2026
- Students learn the molecular basis of each of the 14 identified modifiable risk factors through a chemical perspective
- Most Thursdays at West Philadelphia Senior Community Center teaching in Dementia Prevention Class
- Students provide interactive demonstrations and include relevant steps seniors can take to lower their risk in everyday life



Pair education with **action** to create agency in a susceptible population

Seniors learn about the mechanism of each dementia risk factor & what they can do to lower their risk



Provide seniors with resources



Seniors have agency to lower their own risk

(Undergraduate students design interactive, accessible demonstrations and deliver to seniors at the senior center)

(Fresh produce in otherwise food desert & KN95 masks)

(Measure the seniors' confidence of understanding each risk factor in general & how it contributes to dementia)

Sustainability of Dementia Prevention Project

- Bringing fresh fruits and vegetables to West Philadelphia Senior Community Center weekly
 - Sustained in perpetuity through small donations by the seniors & Philly Food Bucks
- Work with Lynn McCullough to integrate the produce seniors receive each week into her Adult Nutrition Class curriculum

- Seniors decide on mini-projects for each risk factor to assign to undergraduates
- Students documentation component includes instructions to run a demonstration about each risk factor

- Potential to run course through guest lecturers of Penn experts and faculty/grad student coordinators
- Expand to include caregivers

How PGAEF has aided my academic & professional development:

- Better scientist & researcher
- Better student & teacher
- Fulfill the goal of reducing, preventing Alzheimer's disease and other types of dementia

Thank you!