The Synthesis of Environmental Health Impacts on Mental & Physical Wellness in Olathe, KS

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The aim of this assessment is to bridge the gap between mental and environmental health conditions in Olathe, Kansas. It does so by synthesizing existing environmental and human health data to form a narrative about the most important threats, potential mitigation strategies, and their expected impacts on the community. The work being done to bring these two areas of research together is of growing importance as we continue to see a rise in climate-related health outcomes and mental health awareness and advocacy reach a wider public audience.

This community health assessment bridges the gap between mental and environmental health in Olathe, KS, for the purpose of enhancing the local understanding of the connection between the health of their environment and their own quality of life. This assessment builds upon a community resilience assessment by students and faculty at the University of Kansas Edwards Campus (KUEC) in Overland Park, with additional research and data from the Johnson County Department of Health and Environment (JCDHE), Johnson County Mental Health Clinic (JCMHC), the US Census Bureau, the Mid-America Regional Council (MARC), the Johnson County Parks & Recreation District (JCPRD), the Kansas Health Institute (KHI), the U.S. EPA's recently discontinued Environmental Justice Screening Tool (EJScreen),[1] and data collected from the author's capstone project.

Olathe Community Characteristics

Olathe, Kansas is the seat of Johnson County and the home of approximately 151,000 people, making it the fourth largest city in Kansas.[2] It serves as a crossroads of a variety of socioeconomic groups living in Kansas, making it an ideal case study location for determining the human health impacts of existing environmental conditions in a community. Vulnerable populations in Olathe include the Hispanic and Black population, the Deaf community, and the Low-Income population (Personal communication, Dubey,E., JCDHE 2025). A variety of environmental health conditions renders these populations especially vulnerable to threats posed to the entire community. The KUEC community resilience assessment for 2024 lists the top three threats to Olathe as: 1) extreme heat, 2) pollution, and 3) economic recession. Olathe is particularly susceptible to these threats due to a lack of tree-canopy coverage and greenspace, high-percentile rankings for air pollution and proximity to Superfund and other contaminated sites, and a very high cost of living (mostly associated with high housing costs).[3] The following data illustrates the significant environmental health conditions impacting physical and mental wellness in the Olathe community. **Figure 1** illustrates the distribution of low-income residents in Johnson County.

As we can see from the distribution in this Figure, Olathe has the highest concentration of residents living at or below 200% of the Federal Poverty Level (FPL) in Johnson County, where 35% of residents are considered low-income, or living on approximately $53,000 per year or less (EJScreen, 2024, no longer available), including 5.59% of the population in Olathe which is 'impoverished'.[2] The Federal Poverty Level (FPL) for a household of three (2.7 average for Olathe) in this region (the lower 48 states) is $26,650 annual salary.[4] Income disparity within Olathe is extreme, where "median income ranges per household from a low of $24,297 to a high of $250,001 in some neighborhoods. Higher income areas are typically found in the southeast parts of the city, and lower income areas are in the central areas,"[5] including Downtown Olathe. This indicates a financial vulnerability for many residents, which leaves them at greater risk of suffering the most severe and disproportionate impacts of extreme heat and recession as discussed below. This also speaks to the necessity of addressing uniquely local vulnerabilities.

These financial vulnerabilities are compounded for low-income residents living in Olathe by the remarkably high housing costs and costs of living in Johnson County. Researchers in the Johnson County Department of Health and Environment in 2024 developed a community health assessment which in its analysis noted the cost of living for "…a single parent with two children living in our community [Johnson County] in 2024 needs to earn $95,177 per year to maintain an adequate standard of living - nearly $14,000 more per year than they did two years ago."[6] This is significantly higher than what low-income residents are earning in Olathe. As seen from the distribution in Figure 1, neighborhoods in Downtown Olathe range from 51% to 100% of individuals living in these neighborhoods that are low-income residents. As stated previously for this region, that indicates a salary lower than about $53,000 per year.[4]

High housing costs are the main source of financial pressure for people living in Johnson County, leaving some neighborhoods with up to "79% of homeowners being housing-burdened [those who spend 30% or more of their income on housing costs]" and housing costs which "have jumped between 20-24% for renters, homeowners with a mortgage and homeowners without a mortgage.[7] After rent and mortgage costs, energy burden stands to be the next among the top housing financial pressures in Johnson County in the face of extreme heat threats, with heating and cooling units as the cause of an "increased energy demand of 8-19%", compounded by the number of days in a given year which exceed 105 degrees Fahrenheit increasing from 0.7 to

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These financial vulnerabilities are compounded for of Downtown Olathe. Prolonged exposure to extreme heat without sufficient resources (financial) to off-set these temperatures leaves vulnerable populations more at-risk of developing physical and mental health complications, such as "... heat exhaustion, hyperthermia, compromised internal temperature regulation, and in extreme cases, heatstroke leading to multi-organ failure."[3]

Neighborhoods most at risk from emerging heat patterns are those with extensive heat-absorbing, impervious surfaces and minimal tree-canopy coverage—a condition driven by the Urban Heat Island (UHI) effect. Downtown Olathe is particularly vulnerable to this phenomenon.[8] The lack of tree cover and green space, which are critical for sequestering carbon and absorbing heat, combined with an abundance of impervious surfaces, intensifies the UHI effect. As a result, an increase in heat-related health complications and illnesses is highly likely in Downtown Olathe. Olathe can also expect to see heightened pressure on its water systems, and degraded air quality (an area which is already of high concern as noted by the Olathe Resilience Assessment Summary of 2024 conducted by KUEC researchers). Extended periods of rain-free days can quickly turn into droughts, and droughts associated with high temperatures and little tree canopy are the most at-risk for adverse health effects because of extreme heat, poor air quality, and degraded water quality. Over the past 25 years, Olathe, KS has experienced drought of some level in 55% of weeks.[10] These previously mentioned effects include but are not limited to heatstroke, hyperthermia, dehydration, and aggravated or increased asthma symptoms (currently Johnson County experiences a rate of 9.7% of adult asthma).[3,11,12]

Figure 3 presents a map of tree-canopy coverage in Downtown Olathe today.

Among some of the more concerning negative mental health impacts of extreme heat is an observable increased rate of violent crime. In a study published in 2024 by the International Journal of Biometeorology, higher outside temperatures and the onset of Urban Heat Island (UHI) effects were positively correlated with increased rates of violent crime, citing that "violent crime is generally higher in summer and increases with temperature" and that "urban heat island (UHI) effect... the additional heat in the built-up environment from hard surfaces, which absorb, store and radiate heat" is poised to aggravate those symptoms in urban environments (such as Downtown Olathe), and increase over time as the temperatures increase as a result of climate change.[13] This is backed up by MARC, citing that "Increased heat will lead to a 5.3% increase in violent crime" in addition to a "decreased labor productivity of 2.3%" and an "increased energy demand of 8-19%."[8]

A decrease in labor productivity of 2.3% is likely to be indicative of a proportionate decrease in income, a financial shock which many (at least 5.59% in Downtown Olathe, but likely more) can ill-afford. Less income should be interpreted as less resiliency to threats (including greater energy demand to off-set extreme heat), and economic recession which will place even greater pressure on residents struggling to afford housing costs such as rent, mortgage payments, or home repair and weatherization.

Residents in the Downtown Olathe area are also especially vulnerable to mental and environmental health complications because of the city's proximity to multiple hazardous emissions and contaminated sites, and significant air pollution. Contaminated sites include one active National Priorities List (NPL) Superfund site at Chemical Commodities, Inc. (CCI) on South Keeler Street. The CCI site "...occupies approximately 1.5 acres in central Olathe, a suburban community of Kansas City with a population of approximately 60,000...Land use in the area is primarily commercial and residential."[14] Four additional non-NPL active Superfund sites in Olathe are shown in

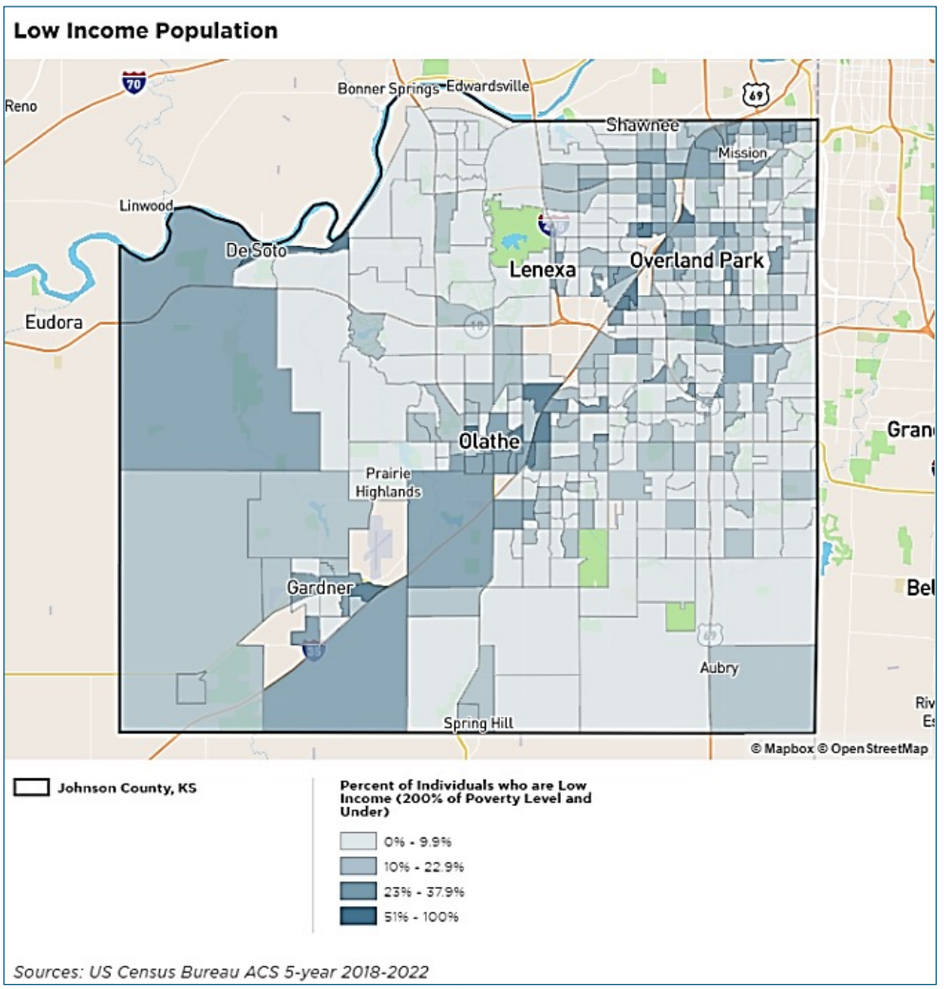

Figure 1 | Income disparity between Olathe and other cities within Johnson County (US Census Bureau 2018-2022). The highest concentration (51-100%) of low-income residents (those living 200% or more below the poverty level) is found in Olathe.

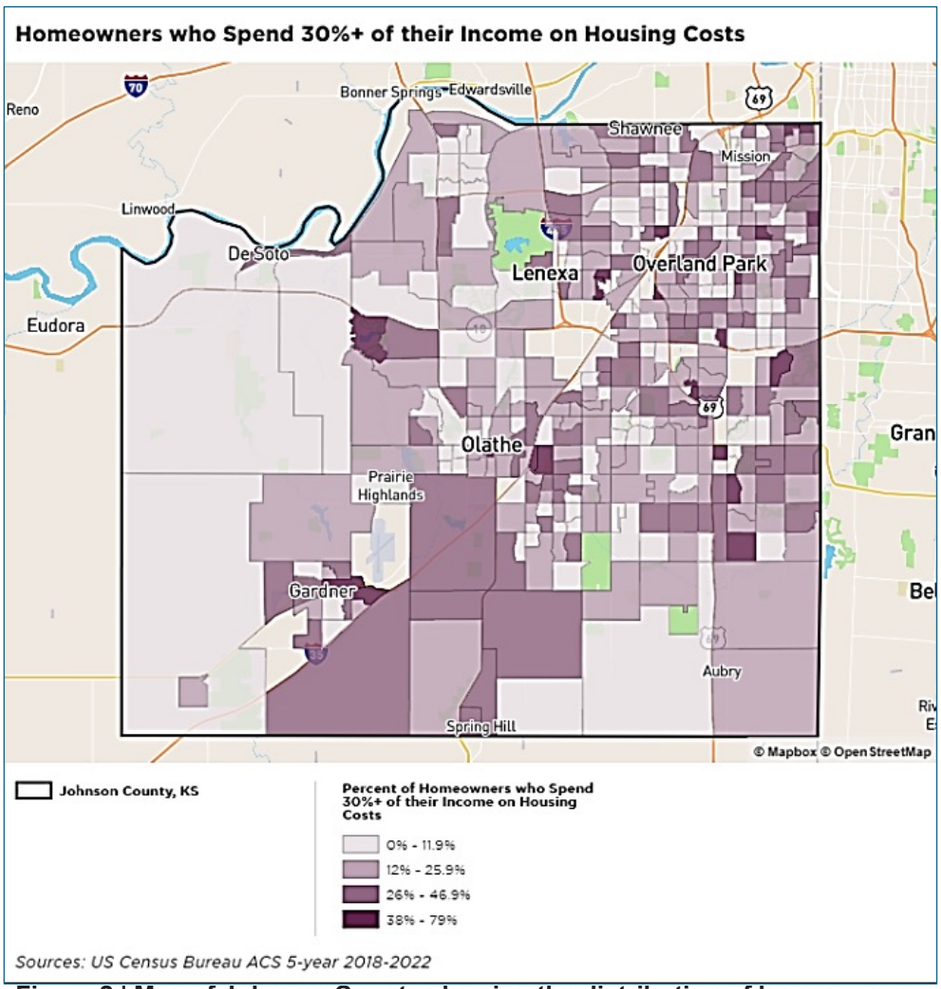

Figure 2 | Map of Johnson County showing the distribution of homeowners who spend more than 30% of their income on housing costs (housing burdened). Source: US Census Bureau, 2018-2022.

the land-use mp of **Figure 4**.

The abundance and proximity of industrial land use areas to single-family residential areas is of high concern. Olathe rated 96th in the national percentile ranking for proximity to Superfund sites in the Olathe Resilience Assessment conducted by KU Edwards researchers in 2024. Olathe also ranked in the 91st-percentile for toxic air emissions, 90th percentile for diesel particulate matter, the 77th-percentile for hazardous waste proximity, and the 63rd-percentile for lead paint prominence in pre-1960s housing. Extreme heat will exacerbate air pollution by means of greater frequency and intensity of wildfires, which release harmful particulate matter into the air, and certain pollutants from vehicle and industrial emissions which feed on higher temperatures (heat waves) and manifest themselves in the form of ground-level ozone, often resulting in a harmful tropospheric haze.[15] Health complications which are closely associated with this phenomenon include pulmonary inflammation, increased risk of heart attack and stroke, Chronic Obstructive Pulmonary Disorder (COPD), and mental health complications as well, including learning disabilities and neurological disease.[15] A summary of Olathe's percentile rankings can be found in the 2024 Olathe Resilience Assessment in **Figure 5**.[3]

Fortunately, a variety of effective mitigation measures for off-setting extreme heat, air and water pollution, and exposure to extremely dangerous neurotoxins such as lead are all within Olathe's reach, both within the city and county, and will now be discussed in further detail. Through a series of strategic governmental and community partnerships, Olathe can begin to see greater resilience to emerging climate patterns and healthier residents, both mentally and physically, as described below.

Mitigation Strategies

Based off data which has been collected and synthesized from previous researchers and case studies at the University of Kansas Edwards Campus (KUEC), the Johnson County Department of Health and Environment (JCDHE), the Mid-America Regional Council (MARC), the Johnson County Parks and Recreation District (JCPRD), and the Johnson County Mental Health Clinic (JCMHC). The recommendation of this assessment is for the City of Olathe to form three strategic partnerships between governmental and community organizations, and to maintain long-term monitoring of the results of these three partnerships. A more detailed description of proposed solutions is included in the full capstone project report. This section will review the recommended strategic partnerships in Olathe as well as examine the expected results of each partnership.

The first partnership should be between the Johnson County Parks & Recreation District (JCPRD), the Olathe Parks & Recreation Department, and the Johnson County Department of Health & Environment (JCDHE). This would be a complementary initiative to expand urban greenspace in Olathe via Superfund (or other contaminated site) remediation projects, followed by a process of turning these remediated sites into parks, and further expanding trails (to include on-street trails) and accessible greenways throughout Olathe (and ideally throughout Johnson County). As a result of such measures Olathe should expect to see an immediate reduction in its percentile ranking for proximity to Superfund sites, as well as reductions in hazardous waste proximity to residential areas, both cited as areas of concern in the 2024 Olathe Resilience Assessment Summary conducted by KUEC researchers. Anticipated health benefits from these measures include a reduction in the prevalence of asthma-related or other respiratory illnesses, a reduction of exposures to hazardous waste and materials, cleaner air, and cleaner groundwater as a result of groundwater filtration and enhanced carbon sequestration into the newly created greenspaces (in addition to further mitigating the Urban Heat Island effect in Downtown Olathe). Quantitative data showing these results in Olathe should be derived from ongoing monitoring.

The second partnership should be between Olathe Public Works and the Heartland Tree Alliance, and possibly JCPRD to initiate tree and native vegetation planting projects along city streets, county greenways, and

on private property. The 2018 Green Heart Louisville Project could be a template for creating natural buffers between industrial sites and residential areas. The Green Heart Louisville Project was launched in Louisville, Kentucky in 2018 to examine the linkages between neighborhood greening and human health and was the first study of its kind to quantify how greening initiatives impact human health and wellbeing. The results of this study concluded that extensive with tree planting and enhanced urban green spaces, we can expect to see "up to a third of particulate matter" filtered out of the air within 300 yards of even a single tree and a significant reduction in rates of cardiovascular disease, strokes, and asthma as a result of improved air quality. We can also expect to see city streets that are about 2-4% cooler than average, reducing high energy demand and energy cost burdens in this low-income community.[16,17] Trees also help reduce stormwater runoff and mitigate urban flooding and simultaneously improve water quality via groundwater filtration.

The third partnership should be between the Olathe Housing Authority (OHA), Olathe Housing Rehabilitation Services, and Hope Builders KC and other non-profit home maintenance organizations to expand their existing home repair and accessibility modification assistance to include home weatherization and lead paint removal. This will help reduce the impacts of and vulnerability to increasing levels of extreme heat (especially for aging residents during the summer months), further reducing the energy burden and expenditures by low-income and housing burdened populations year-round. Doing so also helps maintain sufficient safe and affordable housing stock, an important community priority. Removal of lead paint in older houses also prevents future lead exposure to children living in these neighborhoods, preventing lifelong cognitive injury.

Conclusion

Olathe's significant vulnerabilities to extreme heat, pollution, and economic recession are catalysts for mental and physical health complications including but not limited to respiratory illnesses (including asthma and COPD), heatstroke, multi-organ failure, depression, anxiety, and panic disorders. An economic recession would prove to be devastating to Olathe's sizeable low-income population, leaving many unable to afford adequate housing, utilities (impacting heating and cooling), medical care, or higher education (a pathway for many to attain higher incomes to better provide for their families), creating a feedback loop of vulnerability to negative mental and physical health consequences of extreme heat and pollution.

As described in the mitigation strategies section, however, there is hope. Effective strategies for curbing the onset of extreme heat and pollution such as coordinated strategic partnerships (such as between JCDHE, JCPRD, the Olathe Parks & Rec-

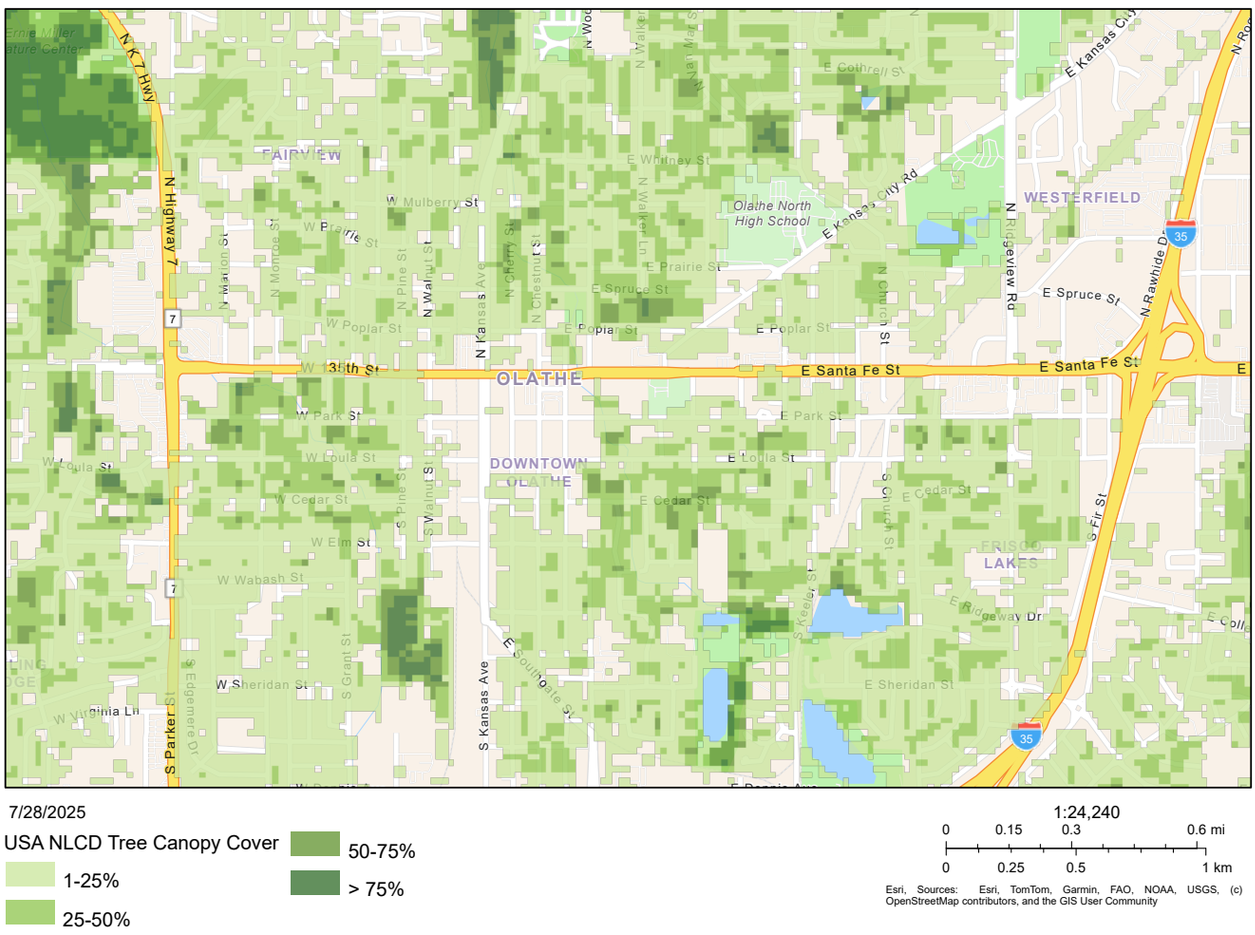

Figure 3 | Map of tree-canopy coverage for Olathe (n.d.). Note the patch of grey area centered on Olathe (Downtown), extending to the south and to the east. University of Kansas Edwards Campus et al., 2024.

reation Department, and community organizations) to expand urban greenspace, tree-canopy coverage, the remediation of contaminated sites found throughout Olathe, and the extension of trail networks, all result in improved health outcomes including but not limited to decreased rates of asthma and other respiratory illnesses (a result of improved air and water quality), cooler temperatures in urban areas (which can potentially decrease the rate of violent crime during the summer months), and a reduction in the energy demand already placing disproportionate amounts of financial stress on low-income communities. Because many of these cited benefits are not yet fully quantified, it is also in the best interest of Olathe and participating organizations to collect and synthesize data on the outcomes of these strategies and strategic partnerships, with the purpose of further quantifying mental health outcomes and prioritizing efforts to address various environmental health threats and conditions in Olathe and beyond.

Author Biography

Robb Morris is a recent graduate of the University of Kansas with a Bachelor of Arts degree in Environmental Studies. During his final semester, he completed a capstone project which had the intended purpose of synthesizing existing human and environmental health data together to form a narrative about the linkages between mental and environmental health, an area of research previously not extensively quantified or studied. The following is a condensed version of his findings. Robb is currently pursuing work in ecological restoration in the Kansas City area.

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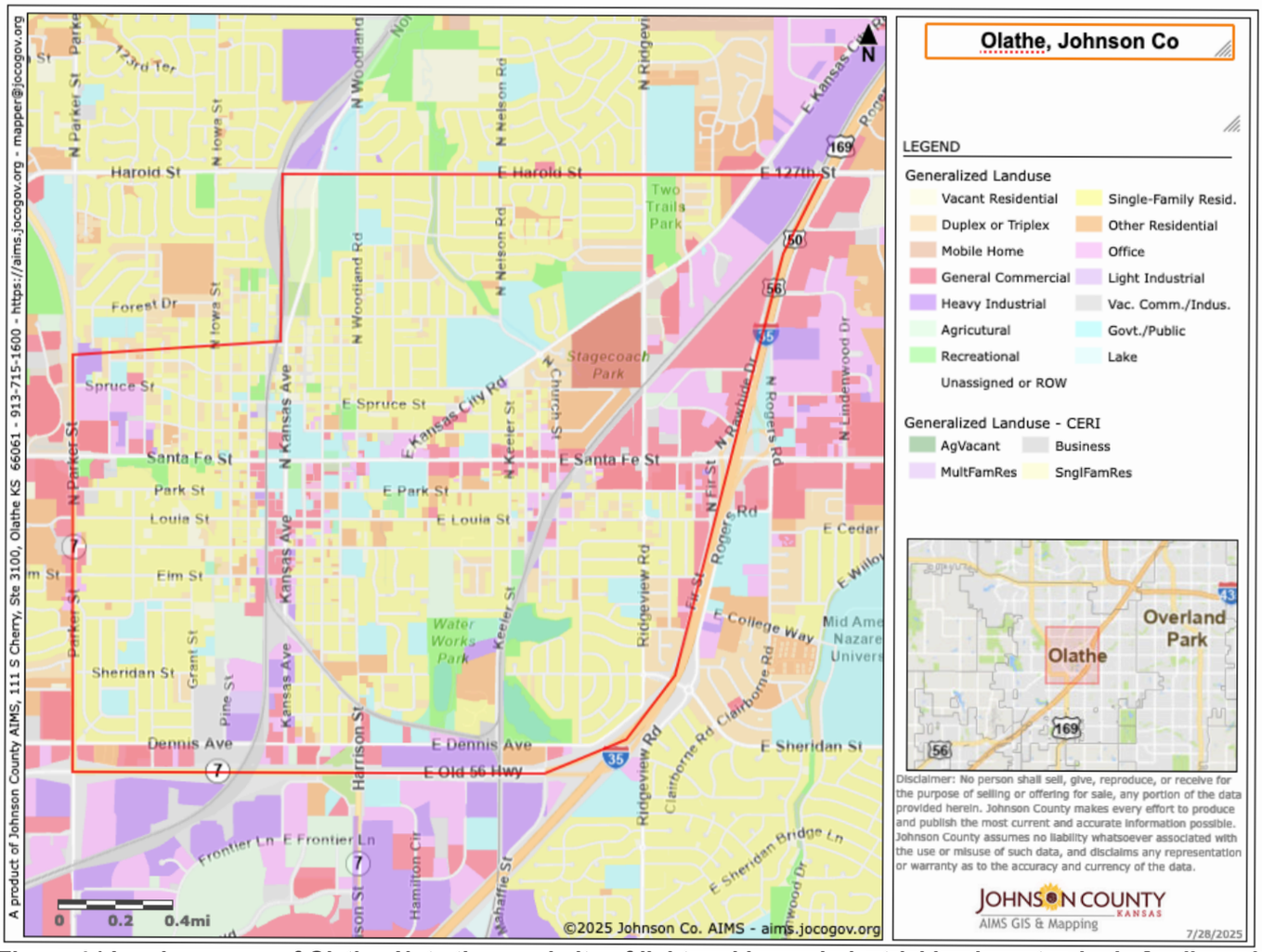

Figure 4 | Land-use map of Olathe. Note the proximity of light and heavy industrial land use to single-family residential parcels (especially along Dennis Avenue & Kansas Avenue). Source: Johnson County, n.d. University of Kansas Edwards Campus et al, 2024.

SELECTED VARIABLES	VALUE	STATE AVERAGE	PERCENTILE IN STATE	USA AVERAGE	PERCENTILE IN USA
ENVIRONMENTAL BURDEN INDICATORS					
Particulate Matter 2.5 ($\mu g/m^3$)	8.36	8.03	61	8.45	57
Ozone (ppb)	55.6	56.8	23	61.8	25
Nitrogen Dioxide (NO_2) (ppbv)	9	7	78	7.8	64
Diesel Particulate Matter ($\mu g/m^3$)	0.21	0.131	90	0.191	67
Toxic Releases to Air (toxicity-weighted concentration)	8,200	13,000	71	4,600	91
Traffic Proximity (daily traffic count/distance to road)	820,000	590,000	69	1,700,000	50
Lead Paint (% Pre-1960 Housing)	0.35	0.36	50	0.3	63
Superfund Proximity (site count/km distance)	2.1	0.24	98	0.39	96
RMP Facility Proximity (facility count/km distance)	2	0.78	94	0.57	94
Hazardous Waste Proximity (facility count/km distance)	4.6	2.4	76	3.5	77
Underground Storage Tanks (count/km^2)	6.2	3.4	80	3.6	82
Wastewater Discharge (toxicity-weighted concentration/m distance)	51	4400	44	700000	50
Drinking Water Non-Compliance (points)	0	1.3	0	2.2	0
SOCIOECONOMIC INDICATORS					
Demographic Index USA	1.45	N/A	N/A	1.34	62
Supplemental Demographic Index USA	1.91	N/A	N/A	1.64	70
Demographic Index State	1.75	1.31	74	N/A	N/A
Supplemental Demographic Index State	1.75	1.32	77	N/A	N/A
People of Color	40%	26%	78	40%	57
Low Income	35%	30%	64	30%	64
Unemployment Rate	7%	4%	81	6%	71
Limited English Speaking Households	7%	2%	87	5%	79
Less Than High School Education	15%	9%	81	11%	74
Under Age 5	6%	6%	59	5%	63
Over Age 64	12%	17%	32	18%	32

Figure 5 | Olathe environmental burdens and socioeconomic indicators. University of Kansas Edwards Campus et al., 2024.

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RuralMed: Bringing Medical Opportunities to Rural Students

by Arisha Safiq

As a student interested in a future in medicine, living in a rural town of 9,000 residents an hour and a half outside of Kansas City, I've come to recognize an opportunity gap I had never heard anyone talk about before. When I first began thinking about medical school, I didn't even know where to start. In rural areas like mine, this is true for many students. No matter how smart you are or how big your dreams may be, the resources to explore interests in fields like medicine or research simply aren't here.

That's how RuralMed began.

RuralMed helps bridge the gap between students in communities like mine and the medical exposure that schools look for. In my own experience, I had to drive several hours just to complete shadowing or volunteering hours in a hospital—time that came at the expense of schoolwork, extracurriculars, and even other volunteering opportunities. RuralMed changes that by bringing resources directly to students, wherever they are. We offer virtual Q&As with healthcare professionals, accessible shadowing experiences, and volunteering opportunities that can be done remotely. My goal isn't just to help students explore medicine—it's to help them succeed as future medical professionals.

This isn't just a project to me—it's personal. I know what it's like to spend hours searching online for answers that could have been given in minutes by a mentor. I remember wondering if someone from a small, rural community could ever wear a white coat. Rural communities don't just need more doctors—they need doctors who understand them, doctors who come from the very communities they serve. And that starts by helping students connect with opportunities that are otherwise out of reach, and by showing them that they belong in medicine too.

If you, or someone you know, would benefit from RuralMed, please see our flyer in the *Resources for Students* section on the next page.