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import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
from geopy.distance import geodesic
import numpy as np

# Step 1: Data setup
data = {
    'County': ['Pictou', 'Inverness', 'Cape Breton', 'Yarmouth', 'Colchester', 'Lunenburg', 'Guysborough', 'Annapolis', 'Queens', 'Kings', 'Digby', 'Cumberland'],
    'Accessible Homes': [16, 6, 29, 5, 6, 8, 6, 7, 1, 4, 4, 5, 6, 11, 1, 6, 1],
    'Total Homes': [36, 16, 80, 16, 17, 13, 41, 14, 7, 9, 5, 25, 12, 28, 4, 8, 6],
    '% Accessible': [44, 38, 36, 31, 35, 62, 15, 50, 14, 44, 80, 20, 50, 39, 25, 75]
}

locations = {
    "Pictou": (45.543238, -62.666417),
    "Inverness": (46.537269, -61.055994),
    "Cape Breton": (46.135109, -60.172928),
    "Yarmouth": (43.8271, -66.119302),
    "Colchester": (45.359487, -63.278571),
    "Lunenburg": (44.294391, -64.324932),
    "Halifax": (44.671237, -63.612627),
    "Hants": (44.975006, -64.127454),
    "Guysborough": (45.337274, -61.001514),
    "Annapolis": (44.890907, -65.149837),
    "Queens": (44.036375, -64.708266),
    "Kings": (45.035165, -64.728666),
    "Digby": (44.242461, -66.130128),
    "Cumberland": (45.650522, -64.060595),
    "Victoria": (46.894797, -60.471929),
    "Richmond": (45.512695, -60.959388),
    "Antigonish": (45.624204, -61.995422),
}

hospital_locations = {
    "Abbie J. Lane Memorial Building": (44.6484, -63.5852),
    "Cape Breton Regional Hospital": (46.1397, -60.1865),
    "St. Martha's Regional Hospital": (45.6175, -61.9866),
    "Yarmouth Regional Hospital": (43.8419, -66.1214),
    "Halifax Infirmary": (44.6414, -63.5912),
    "Cumberland Regional Health Care Centre": (45.3590, -64.3466),
    "Digby General Hospital": (44.6258, -65.7552),
    "Guysborough Memorial Hospital": (45.3596, -61.5161).
}

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    "Sutherland Harris Memorial Hospital": (45.6944, -62.6350),
    "Queens General Hospital": (44.0427, -64.7361),
    "Annapolis Community Health Centre": (44.7410, -65.5291),
    "Valley Regional Hospital": (45.0728, -64.4430),
    "Strait Richmond Hospital": (45.7510, -61.4522),
    "Sutherland Harris Memorial Hospital": (45.6944, -62.6350),
}

# Step 2: Define distance calculation function
def nearest_hospital_distance(loc, hospitals):
    return min(geodesic(loc, hosp_loc).kilometers for hosp_loc in hospitals.values())

# Step 3: Calculate hospital distance for each county
county_distances = {}
for county, coords in locations.items():
    county_distances[county] = nearest_hospital_distance(coords, hospital_locations)

# Step 4: Merge data into DataFrame
df = pd.DataFrame(data)
df['Avg Distance to Hospital (km)'] = df['County'].map(county_distances)

# Step 5: Correlation matrix
corr = df[['Accessible Homes', 'Total Homes', '% Accessible', 'Avg Distance to Hospital']]

# Step 6: Plot the heatmap
plt.figure(figsize=(10, 8))
sns.heatmap(corr, annot=True, cmap='coolwarm', center=0, linewidths=0.5)
plt.title('Correlation Matrix of Key Performance Indicators (KPIs)')
plt.tight_layout()
plt.show()

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