معهد دسمان للسكري
Dasman Diabetes Institute
انشاءه مؤسسة الكويت للتقدم العلمي
Founded by Kuwait Foundation for the Advancement of Sciences

UNIVERSITY OF CANBERRA

Locate 18 – GeoSmart Asia

April 2018, Adelaide

DASMAN DIABETES INSTITUTE-CANBERRA GEOHEALTH INITIATIVE

Building capacity for spatially-enabled health research to understand diabetes in relation to social, built and physical environmental factors in the State of Kuwait

Dr Saad Alsharrah, Professor Mark Daniel, Associate professor Neil Coffee and Dr Faisal Alrefaei

KUWAIT – A CONTEXT

- Located on the northeastern edge of the Arabian peninsula
- The country has 17,820 square kilometers of land
- Population of about 4.2 million people – Approx. 30% National and 70% expatriates

THE DIABETES PROBLEM – A HEALTH AND AN ECONOMIC BURDEN

- 415 million adults have diabetes; this number is expected to rise to 642 million by 2040
- More than 35 million (9%) of adults aged 20-79, live with diabetes in the Middle East and North African (MENA) Region
- the International Diabetes Federation estimated that prevalence of diabetes in Kuwait is about 15 % out of a population of 4 million – compared to Australia with prevalence of 6.5%
- Studies within Kuwait show that prevalence is around 20%
- Mainly due to a change of lifestyle that was entrenched with the growth of oil wealth and rise of obesogenic urbanization
- Kuwait has spent approximately 16% of its health expenditure on diabetes alone in 2010, and it is estimated that this number increase by 150% in 2030

DDI-UC GEOHEALTH INITIATIVE

Aim

To assist DDI build a GeoHealth lab, help build spatial epidemiology expertise and develop knowledge and understanding of the diabetes epidemic in Kuwait through spatial associations.

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- The GeoHealth lab is a spatial infrastructure enabling process which includes hardware, software, data, methodology and staff capacity building, including education and Higher Degree Students.
- The project is designed in three phases where each phase incorporates certain objectives and deliverables.

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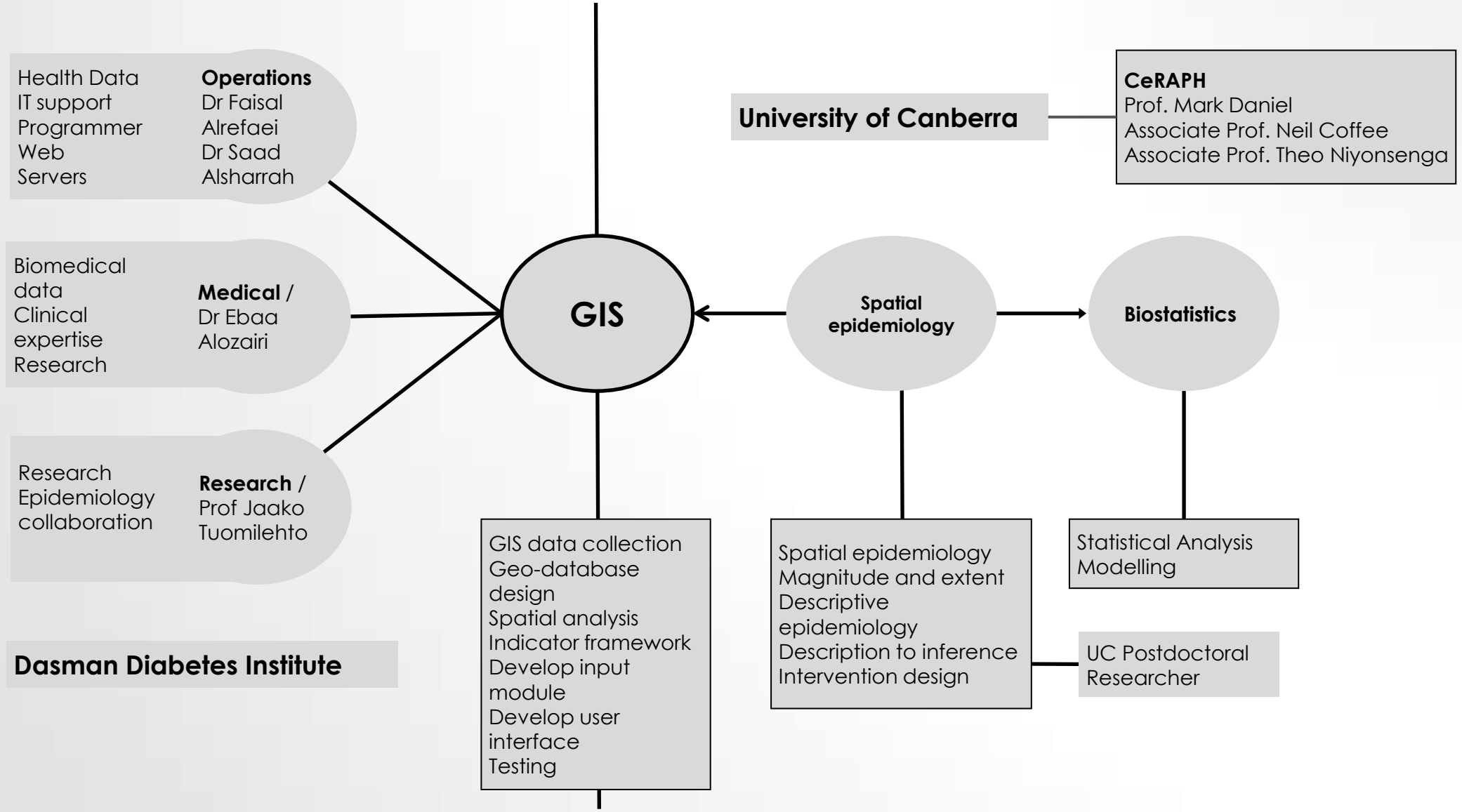
PROJECT PHASES

Years 1 - 2	Years 3 - 4	Years 5 - 6
Phase 1: Capacity Building	Phase 2: Direct Observation	Phase 3: Prevention and Intervention
- Prevalence of diabetes in Kuwait (magnitude and extend) - Data collection - Consolidating GIS infrastructure - Basic descriptive epidemiology Spatial Epidemiology - Population monitor design - Training for DDI staff - series of intensive workshops	- Spatial observations - Primary data on behavior, lifestyle and environment - Direct observation - Population survey - High resolution data - Description to inference - Geo database development - Develop input model - Develop user interface	- Prevention and Intervention programs - Shift the norms

Training, Education and Dissemination
Seminars | Workshops | Spatial Epidemiology Graduate Diploma | Publications

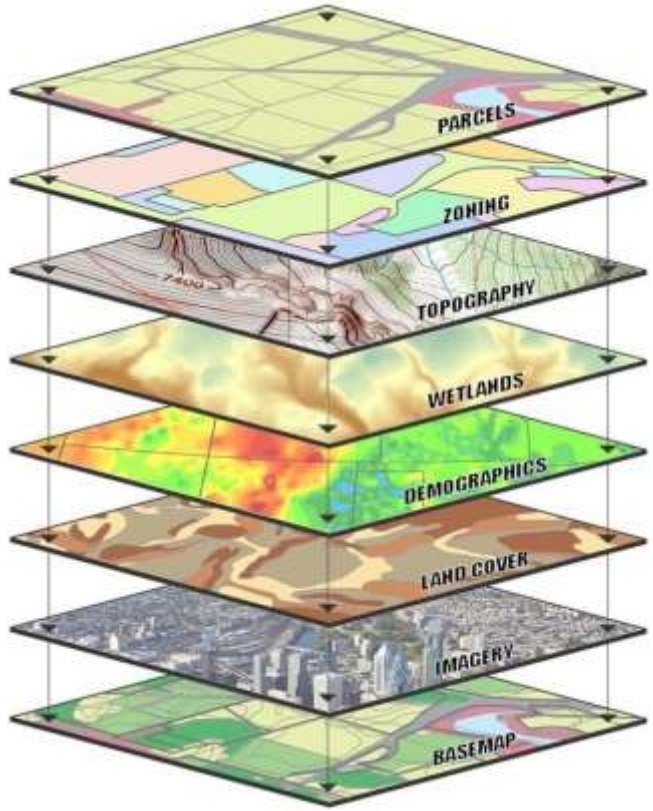
DDI & UNIVERSITY OF CANBERRA



ESSENTIAL GIS DATA

GIS Data

PACI	ArcGIS Online access to PACI Geoportal
CSB	GIS Shapefiles – Governorates, Suburbs, Blocks, Road network
Municipality	GIS Shapefiles – Governorates, Suburbs, Blocks, Parcels for the Capital governorate
European Space Agency	10 meter multispectral resolution satellite image



KEY VARIABLES

Built Environment	Physical Environment	Health & Demography
- Public Open Space - Parks - Cooperatives - Schools - Fast foods - Primary Health Care centres	- Temperature - Air Quality - Dust	- Age - Gender - Race - Socioeconomic status - Vital signs - Phenotypes - Bio markers of disease

PUBLIC AUTHORITY FOR CIVIL INFORMATION (PACI) - CIVIL IDENTIFICATION (CIVIL ID)

Civil ID for all residents in Kuwait (Nationals & Non-nationals)

- Unique ID
- Each civil ID is linked to a unique Address ID
- Smart chip
- Linked to all ministries and governments services

PACI – KUWAIT FINDER

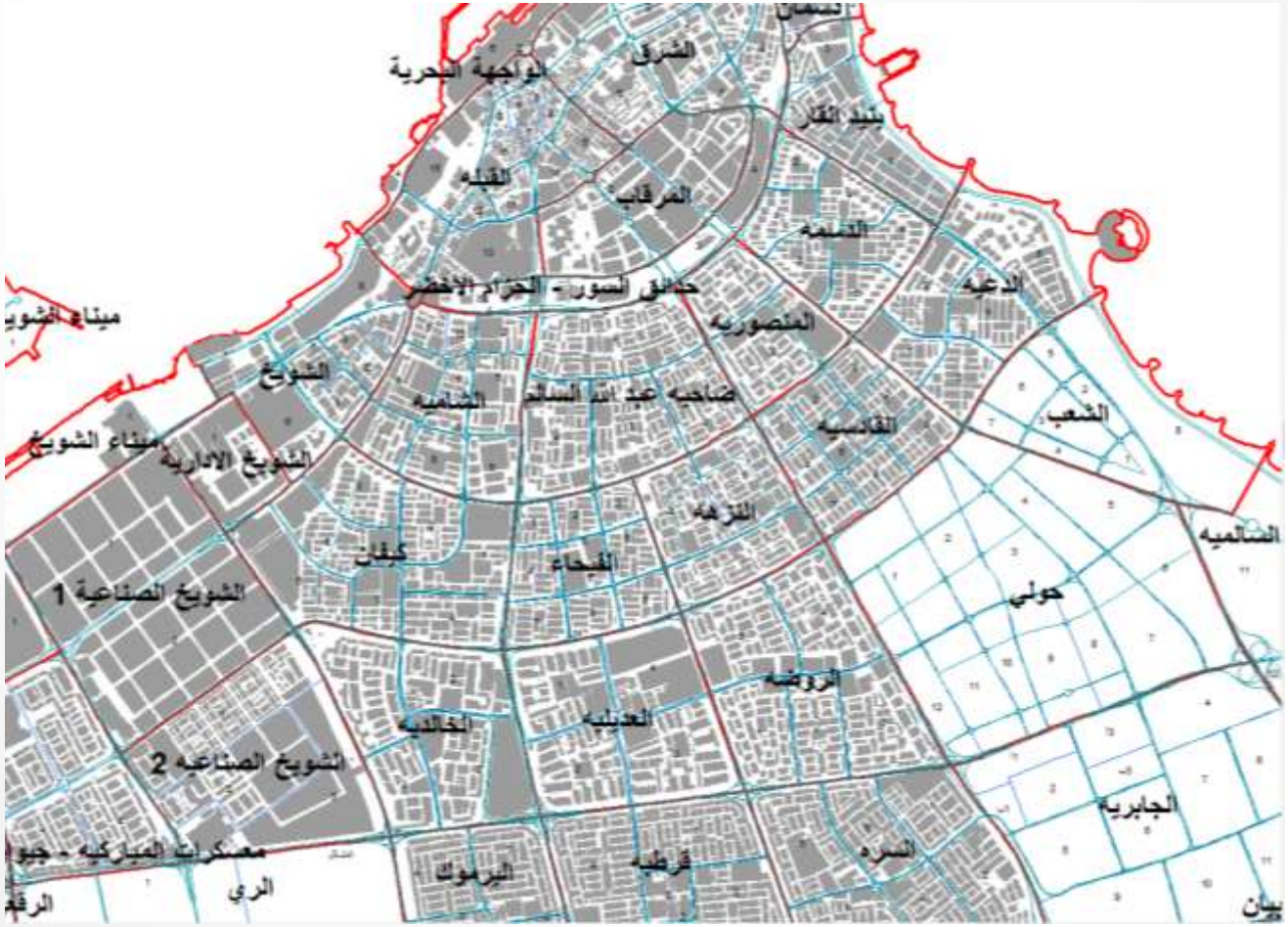
DDI User Access
GIS Online Portal

GEOCODING

- Data Quality
- Proxy – suburb-block to map diabetic patients
- Aggregated to the block level (census tract SA1)

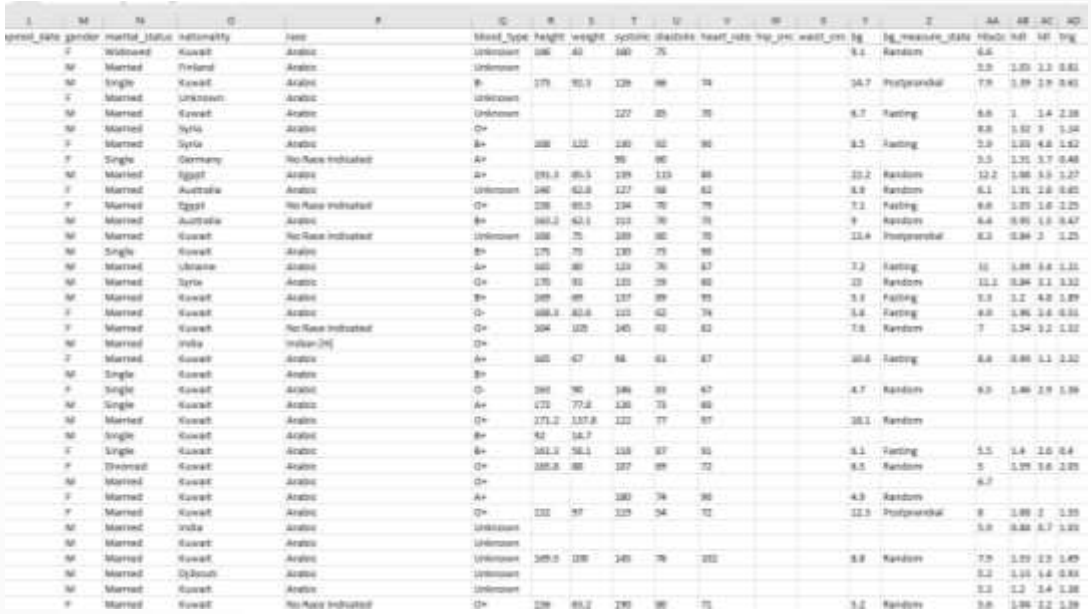
MUNICIPALITY AND CSB GIS DATA

- Governorates
- Suburbs
- Blocks
- Roads – Major and Minor
- Parcels – Capital only
  - Parks
  - Mosques
  - Schools
  - Coops

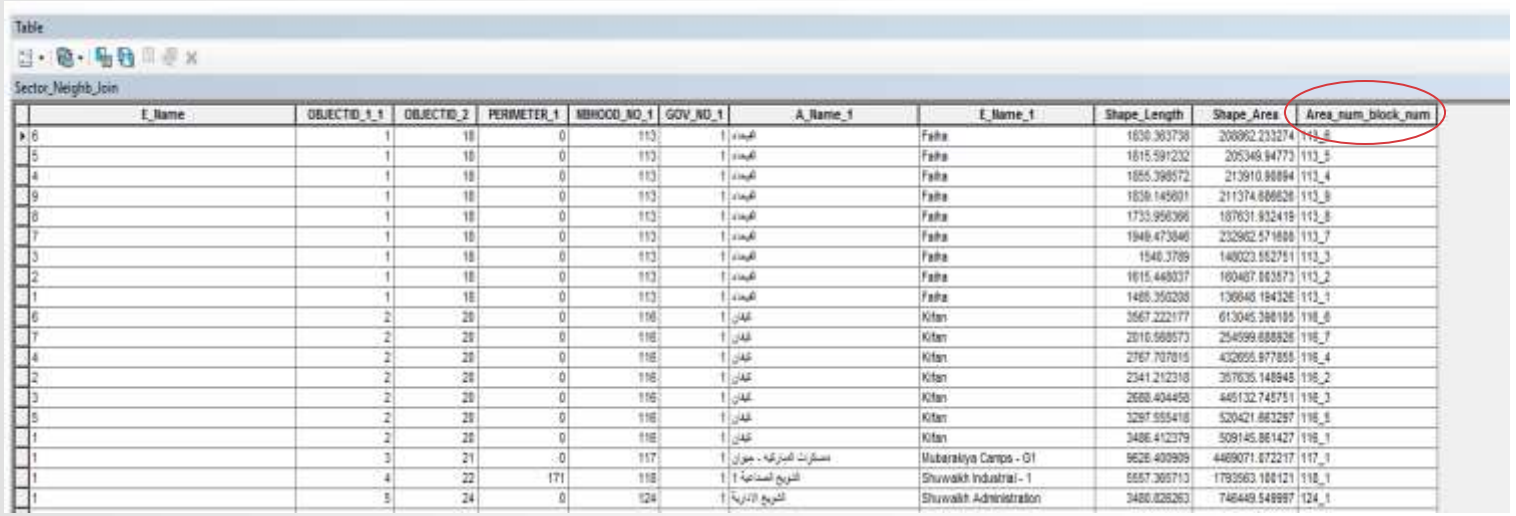


PILOT STUDY
DDI HEALTH DATA – NOVEMBER EXTRACT

- Fake ID
- District name – Governorate
- Area name – Suburb
- Block
- Street
- Building
- Age as of Nov 1
- Gender
- Nationality
- Race
- Blood Type
- Height
- Weight
- Systolic
- Diastolic
- Heart rate
- Blood glucose
- Blood glucose measure state
- HbA1c
- HDL
- IDL
- Trig



DDI GIS PILOT – METHODS



Table

Sector_Neighb_Join

E_Name	OBJECTID_1_1	OBJECTID_2	PERIMETER_1	MHOOD_NO_1	GOV_NO_1	A_Name_1	E_Name_1	Shape_Length	Shape_Area	Area_num_block_num
6	1	18	0	113	1	الفيحاء	Faiha	1630.363738	208962.233274	113_6
5	1	18	0	113	1	الفيحاء	Faiha	1815.591232	205349.94773	113_5
4	1	18	0	113	1	الفيحاء	Faiha	1855.398572	213910.96894	113_4
9	1	18	0	113	1	الفيحاء	Faiha	1839.145801	211374.686626	113_9
8	1	18	0	113	1	الفيحاء	Faiha	1733.956366	187631.932418	113_8
7	1	18	0	113	1	الفيحاء	Faiha	1949.473846	232962.571698	113_7
3	1	18	0	113	1	الفيحاء	Faiha	1548.3789	148023.552751	113_3
2	1	18	0	113	1	الفيحاء	Faiha	1615.449337	160467.883673	113_2
1	1	18	0	113	1	الفيحاء	Faiha	1485.350208	136646.184326	113_1
6	2	20	0	116	1	غليلان	Kifan	3567.222177	613045.398185	116_6
7	2	20	0	116	1	غليلان	Kifan	2010.568573	254599.688926	116_7
4	2	20	0	116	1	غليلان	Kifan	2767.707015	432655.977855	116_4
2	2	20	0	116	1	غليلان	Kifan	2341.212318	357635.148945	116_2
3	2	20	0	116	1	غليلان	Kifan	2688.404458	445132.745751	116_3
5	2	20	0	116	1	غليلان	Kifan	3297.555418	520421.883297	116_5
1	2	20	0	116	1	غليلان	Kifan	3486.412379	509145.861427	116_1
1	3	21	0	117	1	مستشفيات المباركية - جوان	Mubarakiya Camps - G1	9626.409909	4469071.872217	117_1
1	4	22	171	118	1	الشويخ الصناعية 1	Shuwaikh Industrial - 1	5557.369713	1793563.186121	118_1
1	5	24	0	124	1	الشويخ الادارية	Shuwaikh Administration	3480.828263	746449.549997	124_1

Suburbs and Blocks – Unique identifier

Table

Patient_Data.csv

district_name	area_name	block	street	building	area_number	Area_num_block_num	Area_Block_Fake_ID
Capital Area	Dasman	0	<Null>	<Null>	101	101_0	101_0_1020
Capital Area	Dasman	0	0	0	101	101_0	101_0_5566
Capital Area	Dasman	0	0	0	101	101_0	101_0_6150
Capital Area	Dasman	0	0	0	101	101_0	101_0_7338
Capital Area	Dasman	0	0	0	101	101_0	101_0_9048
Capital Area	Dasman	1	11	5	101	101_1	101_1_1223
Capital Area	Dasman	1	17	800060	101	101_1	101_1_1591
Capital Area	Dasman	1	<Null>	<Null>	101	101_1	101_1_3157
Capital Area	Dasman	1	Ebn Mesbah	Dasman Hotel	101	101_1	101_1_3282
Capital Area	Dasman	1	BRITSH EMBASSY	<Null>	101	101_1	101_1_4139
Capital Area	Dasman	1	MOHAMED AL MESBAH	14	101	101_1	101_1_4153
Capital Area	Dasman	1	168	13	101	101_1	101_1_6281
Capital Area	Dasman	1	<Null>	<Null>	101	101_1	101_1_6386
Capital Area	Dasman	1	1	80005	101	101_1	101_1_7239
Capital Area	Dasman	1	168	Borg Alnoor	101	101_1	101_1_7518
Capital Area	Dasman	1	11	5	101	101_1	101_1_8677
Capital Area	Dasman	2	21	3	101	101_2	101_2_404
Capital Area	Dasman	2	Alsour Str.	800054	101	101_2	101_2_452
Capital Area	Dasman	2	Al Sour	800054	101	101_2	101_2_717
Capital Area	Dasman	2	Soor St	800054	101	101_2	101_2_1707
Capital Area	Dasman	2	Al Sour Street	800054	101	101_2	101_2_3664

Patient data – unique address ID

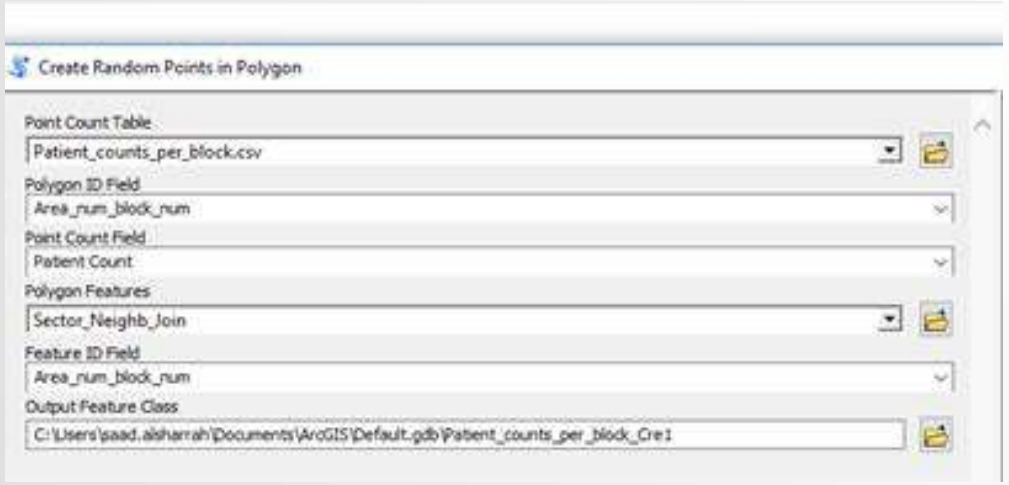
Table

Patient_counts_per_block.csv

Area_num_block_num	Patient Count
_	1
_0	2
_1	4
_10	2
_11	1
_12	1
_2	3
_2 alsurra	1
_3	3
_4	2
_5	3
_6	1
_8	1
_9	2
_a	1
_Al sawaber	1
_AL SHAMIA PART 5 ST,55	1
_al shamiya- part 5	1
_B	1
_kuwait city 4	1
_unknown	1
101_	2
101_.	6
101_0	5
101_1	11
101_2	11

Count of patients per block

DDI GIS PILOT – METHODS



GIS tool for assigning patients as spatial points within their respective blocks

Data Input

GIS
Suburbs
Blocks

Tabular
Patient data
Count per block

Data prep – GIS merge, block patient count table, generate unique spatial identifier

Clean up data for processing – data issues E.g. Duplicates, missing fields, format

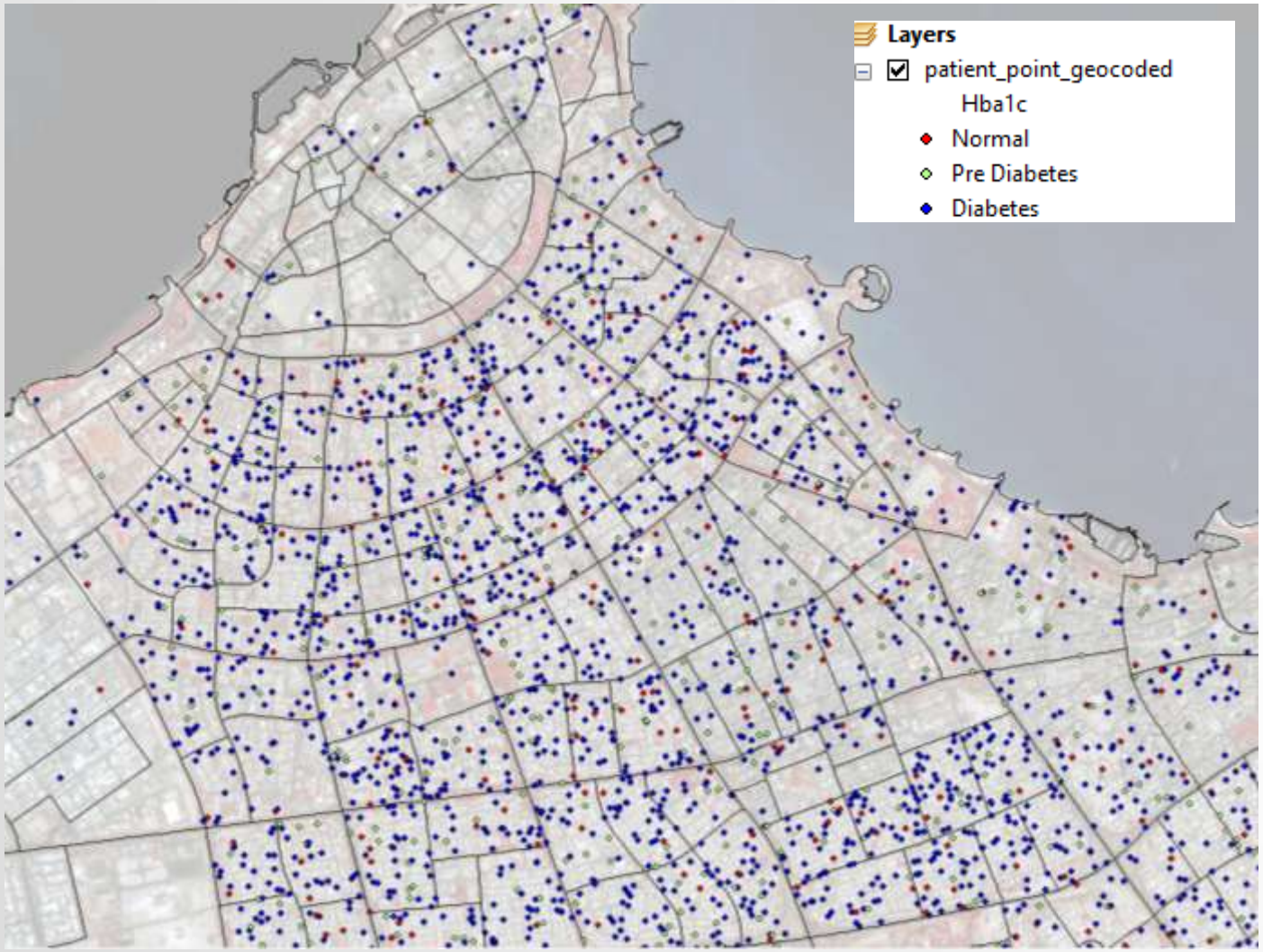
Create random points

Link random points in polygon

RESULTS – DDI PATIENTS GEOCODED

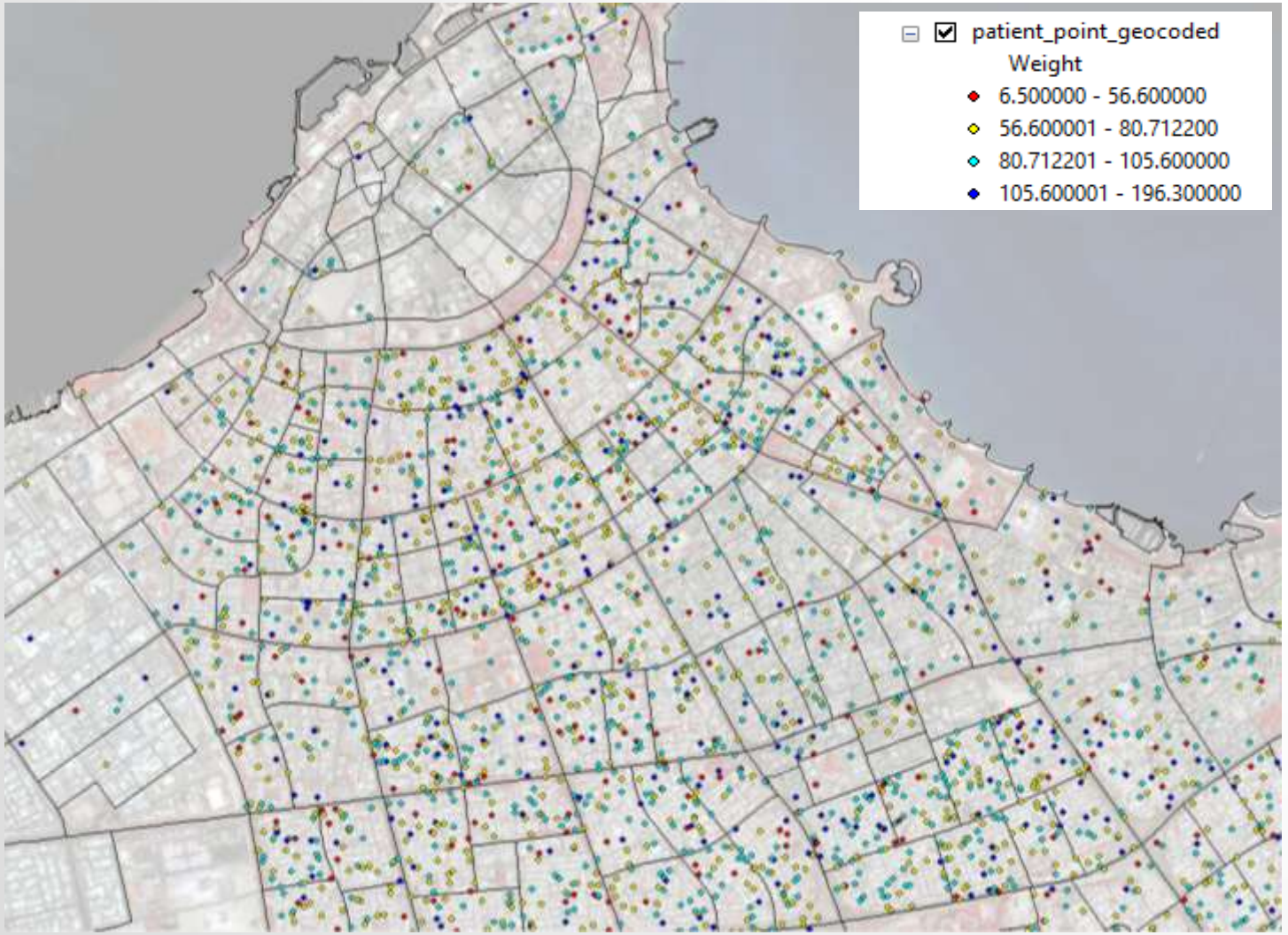
Patients are randomly distributed within their respective blocks (Geo-masking their location)

SYMBOLOGY AND SPATIAL VISUALIZATION



Expected results – patients under investigation are diabetics

SYMBOLOGY AND SPATIAL VISUALIZATION

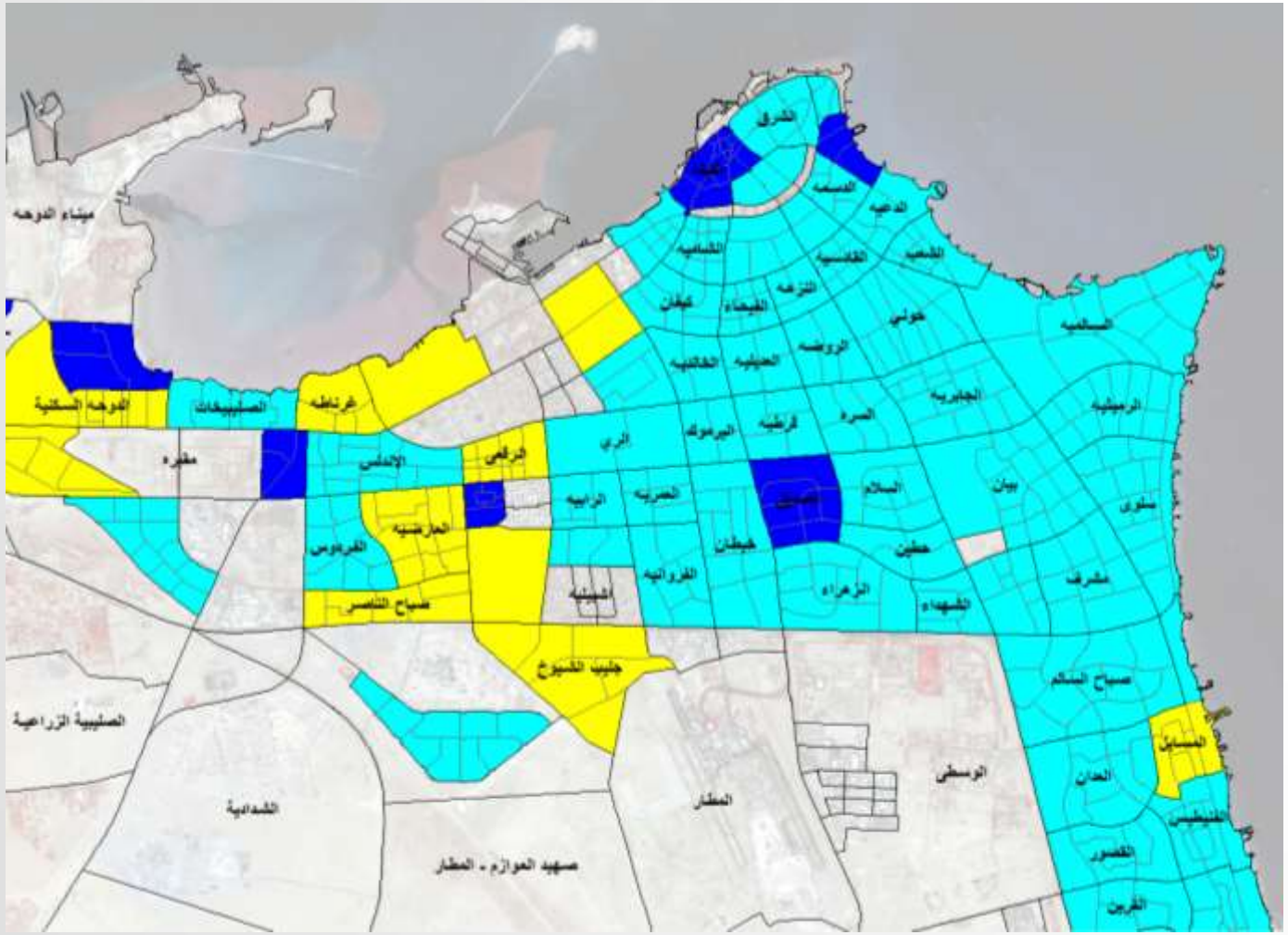


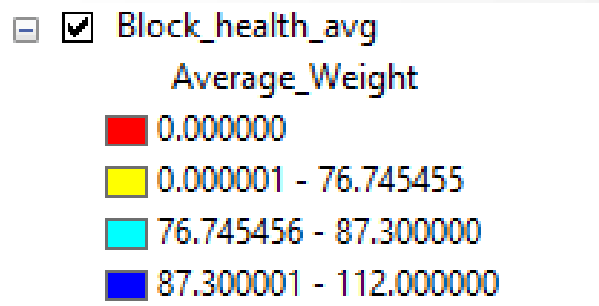
Spatial visualization of weight classes

Diabetics - likelihood to be overweight

Can be utilized to understand environmental association such as food and open public space

ANALYSIS

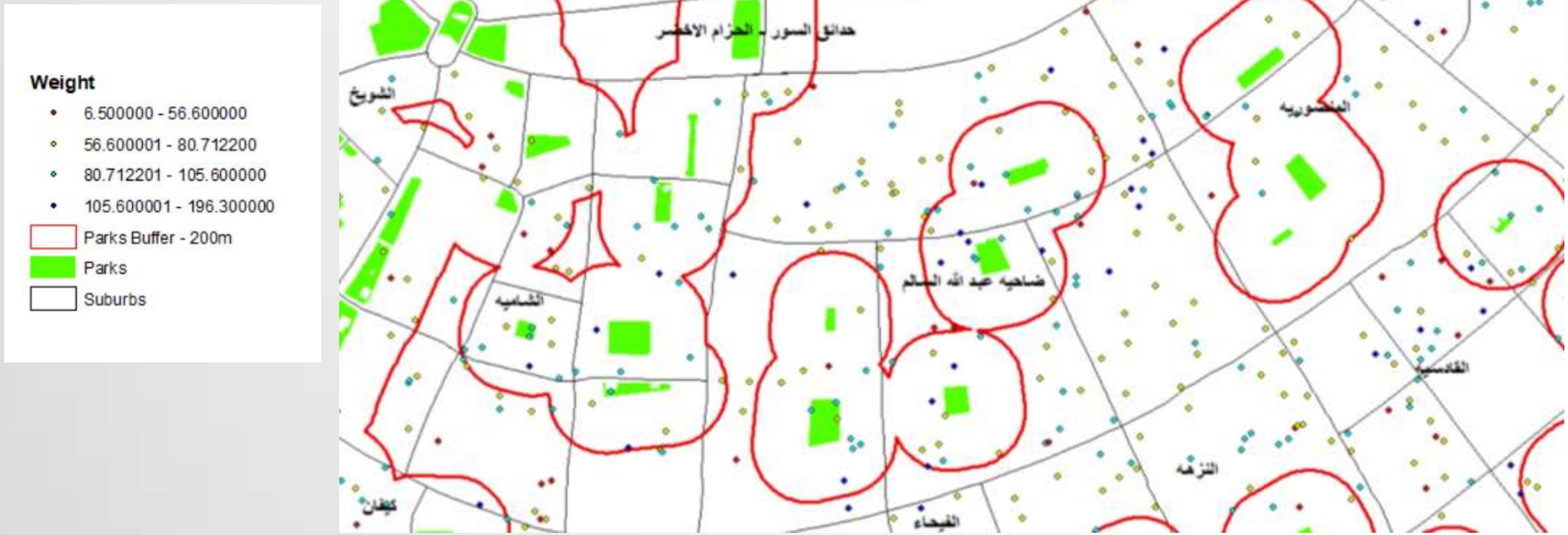




Average weight at the block level

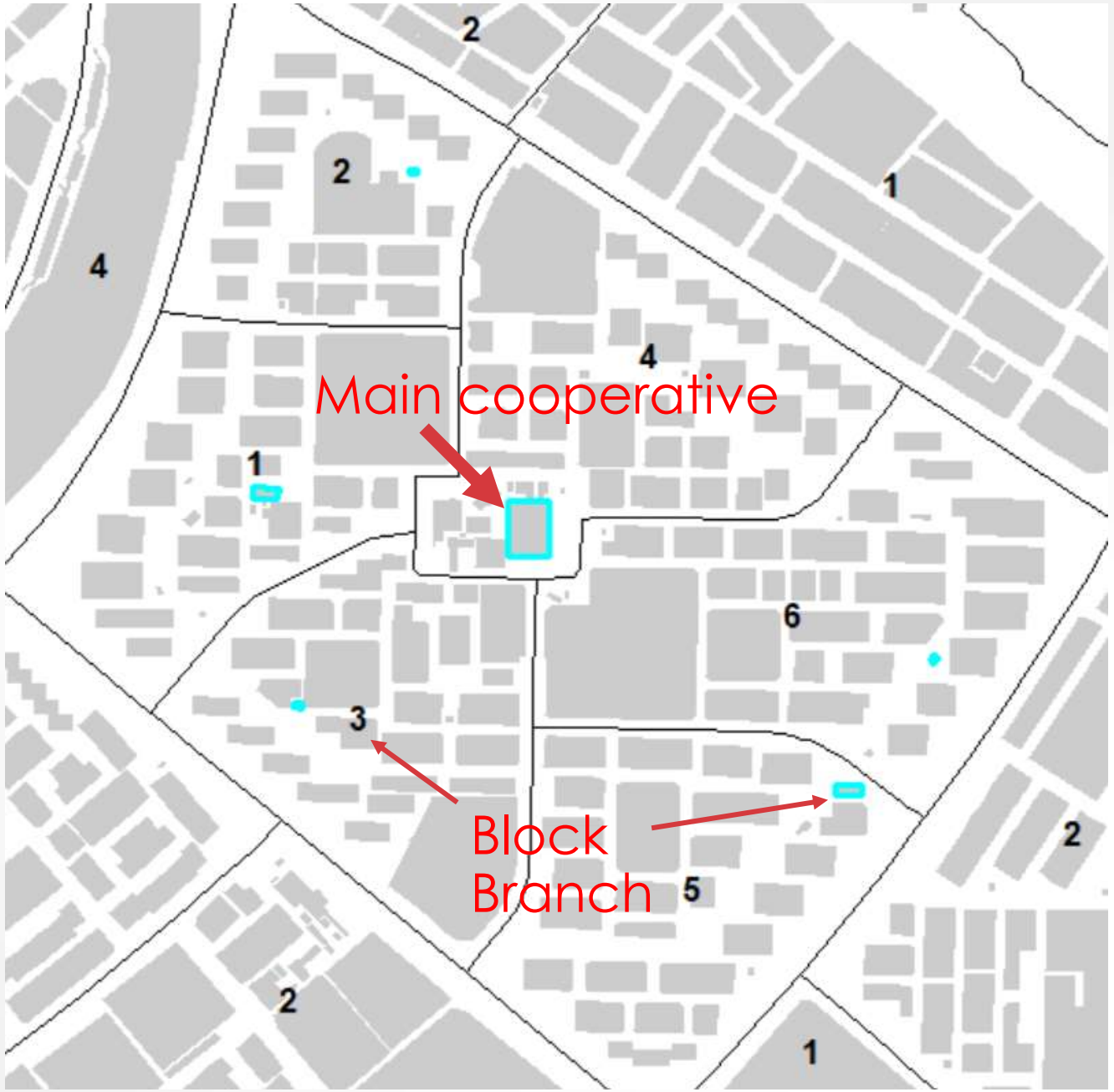
ANALYSIS

Green Space
Proximity to Fast Food



COOPERATIVES

- Comprising 70% of the retail trade in the country
- Legal basis for consumer cooperatives was established in 1962
- Suburb residents are shareholders in their respective cooperatives
- Shareholders retain unique membership IDs
- Non retained profit is distributed as dividends to existing shareholders



GRADUATE CERTIFICATE IN GEOSPATIAL HEALTH

Graduate Certificate in Geospatial Health

Unit 1: GIS in Health

October 2018 – 1 week intensive

Basic concepts of spatial cognition, spatial technologies and spatial models and the major technologies for dealing with spatial information, GIS, remote sensing, and GPS.

Unit 2: Statistical Analysis of Spatial Data

December 2018 – 1 week intensive

principles and methods of reasoning that underlie biostatistics. It will provide knowledge and abilities regarding specific descriptive and inferential techniques commonly used in population health practice and research.

Unit 3: Advanced Spatial Modelling and Analysis for Health Research

February 2018 – 1 week intensive

This unit broadens the theoretical basis and introduces advanced GIS concepts including the creation, visualization and analysis of multidimensional spatial data.

Unit 4: Research Project in Health PG

Mar/May 2019 – on-campus (DDI) + distance mode (UC) supervision

In this unit students undertake applied spatial health research that can be individualized to suit student personal interest and student workplace relevance.

For inquiry - contact:

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THANK YOU