Cancer Mapping the EUROHEIS Way

Marc-Erick Thériault
Surveillance Unit, Division of Preventive Oncology
Cancer Care Ontario

Objectives

- Introduce EUROHEIS/SAHSU
  - Who, Where, Why, Relationship
- RIF System for Spatial Analysis
  - SAHSU Original $\rightarrow$ EUROHEIS Current
  - Software, Hardware, Data
  - View system
- Implementation at CCO for cancer mapping or exposure analysis
- Discussion

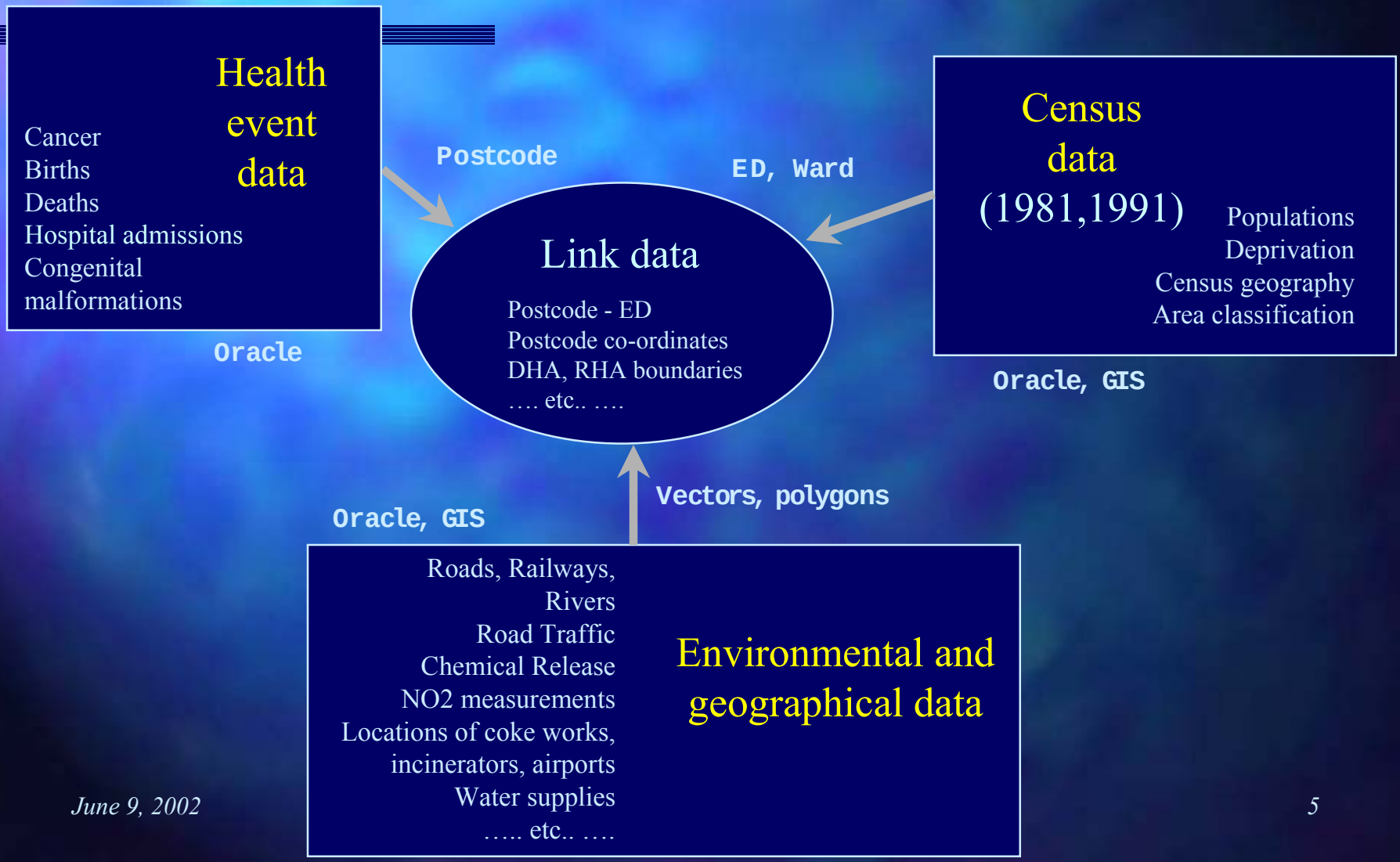
Small Area Health Statistics Unit (SAHSU)

- *Government response to scientific and public interest in distribution of disease across small areas*
- "cluster" of childhood leukemia near Sellafield nuclear plant in 1983
- Department of Epidemiology & Public Health, Imperial College School of Medicine, London, England
- Epidemiologists, statisticians, DBAs, GIS programmers

SAHSU

- To undertake work concerned with the assessment of the risk to the health of the population from environmental factors with particular reference to the interpretation of routine health statistics.
- To quickly undertake and advise on reports (formal and informal) of unusual clusters of disease, particularly in the neighbourhood of industrial installations.

SAHSU data sources



EUROHEIS Project

- European Heath Information System for Exposure and Disease Mapping and Risk Assessment
- Aims to improve understanding of the links between environmental exposures, health outcomes and risk through the development of integrated information systems for rapid assessment of relationships between environment and health at a geographical level.
- Feasibility of system for point/line/area source investigations and exposure mapping within partner countries.

EUROHEIS members

- *UK* - SAHSU, Dept. Epidemiology & Public Health, Imperial College
- *Spain* - Dept. Statistics & Operation Research, University of Valencia
- *Italy* - WHO European Centre for Environment & Health, Rome
- *Denmark* - National Board of Health
- *Finland* - National Public Health Institute
- *Sweden* - Dept. Epidemiology, Stockholm Centre of Public Health
- *Ireland* - Dept. Public Health, UCD
- *France* - INSERM

EUROHEIS goals

- Assess previously developed statistical methodologies
- Obtain overview of geographically referenced datasets currently available to each member
- Impact of data quality and resolution on estimates of disease occurrence
- Develop the SAHSU RIF system to include a more generalized module for disease and exposure mapping

Rapid Inquiry System (RIF)

- GIS based analysis for disease mapping and exposure assessment
- Paul Aylin et al. A national facility for small area disease mapping and rapid initial assessment of apparent disease cluster around a point source: the UK Small Area Statistics Unit, *Journal of Public Health Medicine*, Vol. 21, 289-298 (1999)

SAHSU RIF

- Entirely UNIX based
- "moated" Sun Sparc cluster with ORACLE PL/SQL housing all data - security?
- Another server running ARC/INFO
- GIS server communicates with DB using Arc macro language (ML)
- User interface in Tcl/Tk
- statistical programming in Pro*C
- Reports in HTML

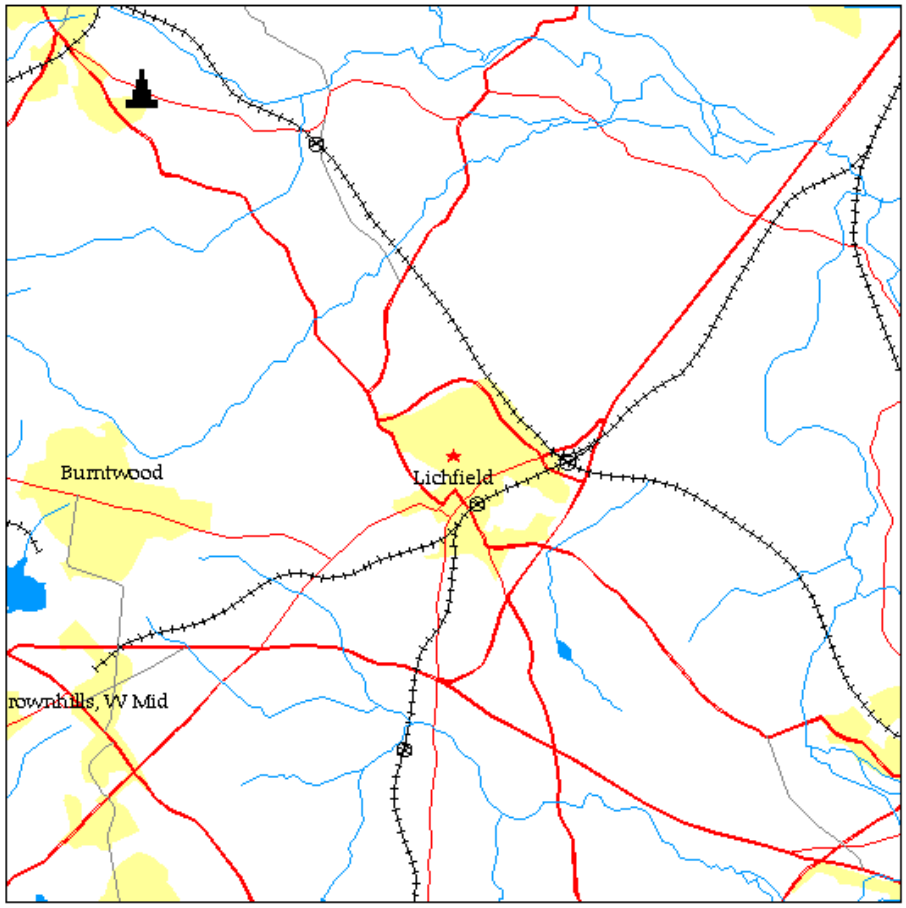
Rapid Inquiry Facility

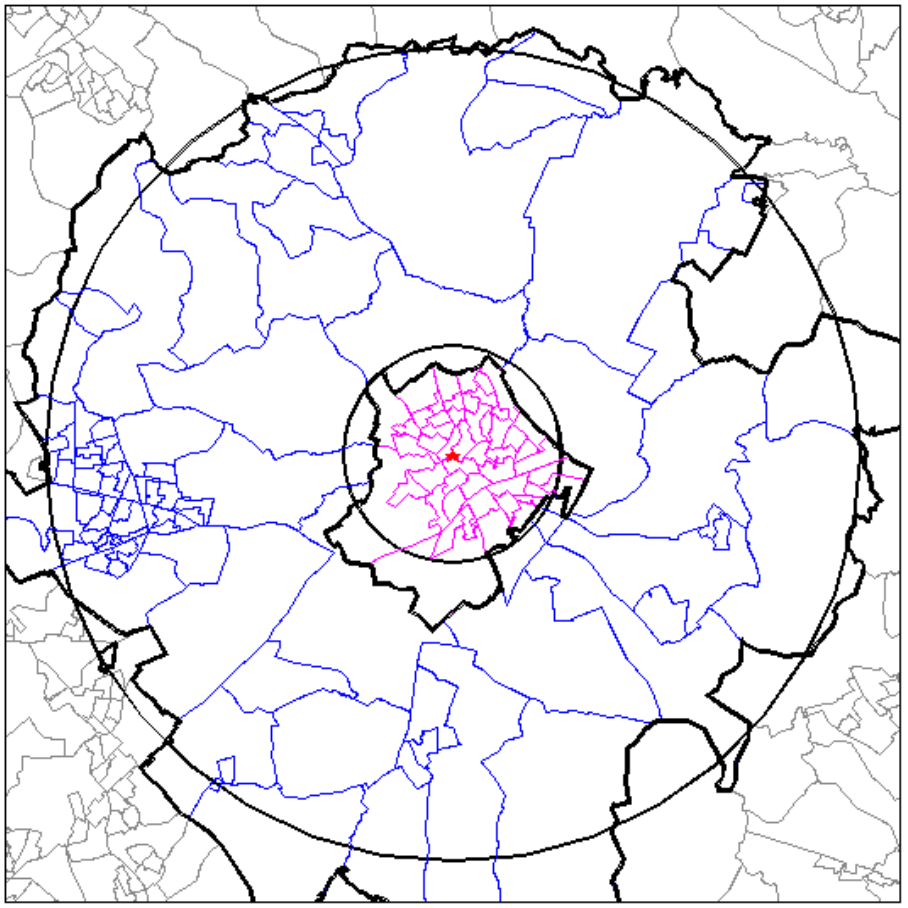
ARCPLOT

Change Groups | Locale | Population | Social | Outcome | Utilities | Quit

Locale: group 1

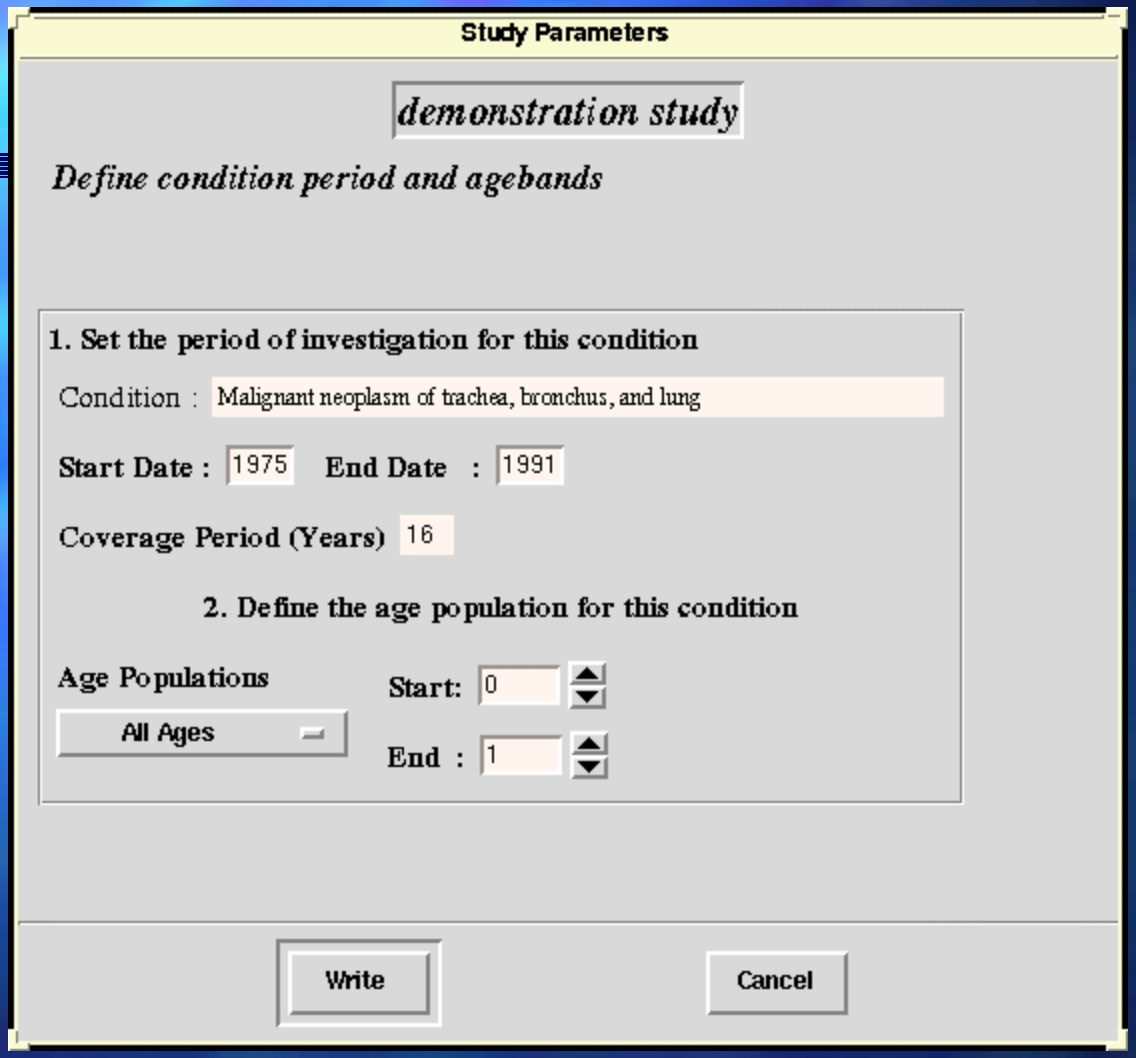
ED bands used in group 1





Point source
Station
Pollution Source
Urban Area
Lake
Motorway
Primary Road
A Road
B Road
Railway
River

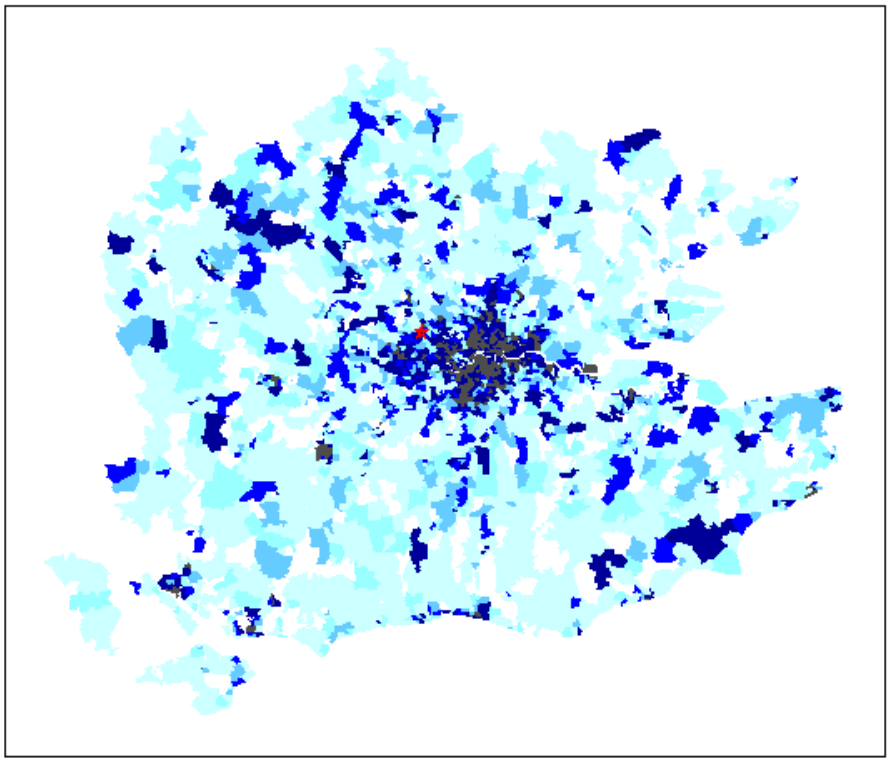
Band 1 (0 - 2km)
Band 2 (2 - 7.5km)
Point source


Study Parameters
demonstration study
Define condition period and agebands
1. Set the period of investigation for this condition
Condition : Malignant neoplasm of trachea, bronchus, and lung
Start Date : 1975 End Date : 1991
Coverage Period (Years) 16
2. Define the age population for this condition
Age Populations
All Ages
Start: 0
End : 1
Write
Cancel

ARCPLOT

Pan/Zoom x,y: 5.95472,8.85827
dx,dy: 5.95472,8.85827 dist: 10.67369

Group 1:
Malignant neoplasm of trachea, bronchus, and lung
(no adjustments)



< 0.60 0.95 - 1.04 > = 1.50
0.60 - 0.84 1.05 - 1.14
0.85 - 0.94 1.15 - 1.49

Group 1:
Malignant neoplasm of trachea, bronchus, and lung
(smoothed - adjusted for deprivation)

< 0.60 0.95 - 1.04 > = 1.50
0.60 - 0.84 1.05 - 1.14
0.85 - 0.94 1.15 - 1.49

Netscape:

File Edit View Go Communicator Help

Back Forward Reload Home Search Netscape Print Security Stop

Bookmarks Location: file:/home/rapidresp/query/output/S6201/index.htm What's Related

Results : Investigation 1
Malignant neoplasm of trachea, bronchus, and lung, All ages

Malignant neoplasm of trachea, bronchus, and lung , All ages
A point source (1981 – 1997)

Deprivation Adjusted	Band	Sex	Obs	Exp	Relative Risk	95% CI Low Lim	95% CI Upp Lim
No	0.0km to <2.0km	Male	167	157.4	1.06	0.91	1.23
		Female	42	58.4	0.72	0.53	0.97
		M+F	209	215.9	0.97	0.85	1.11
	2.0km to <7.5km	Male	287	299.2	0.96	0.85	1.08
		Female	93	106.1	0.88	0.71	1.07
		M+F	380	405.3	0.94	0.85	1.04
Yes	0.0km to <2.0km	Male	167	142.5	1.17	1.01	1.36
		Female	42	52.9	0.79	0.59	1.07
		M+F	209	195.4	1.07	0.93	1.22
	2.0km to <7.5km	Male	287	229.9	1.25	1.11	1.40
		Female	93	86.4	1.08	0.88	1.32
		M+F	380	316.4	1.20	1.09	1.33

100%

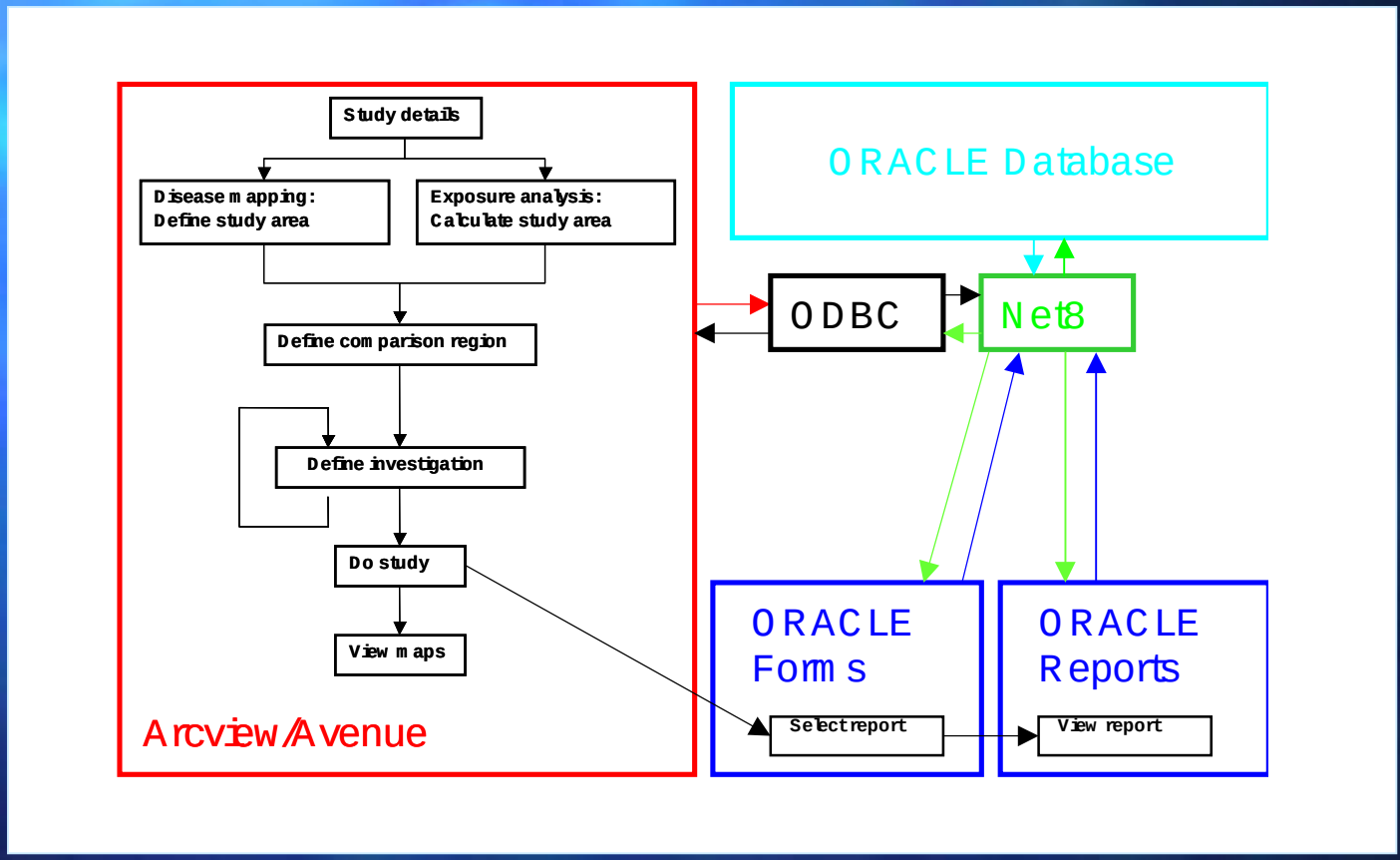
Marc's 1st impression of SAHSU RIF

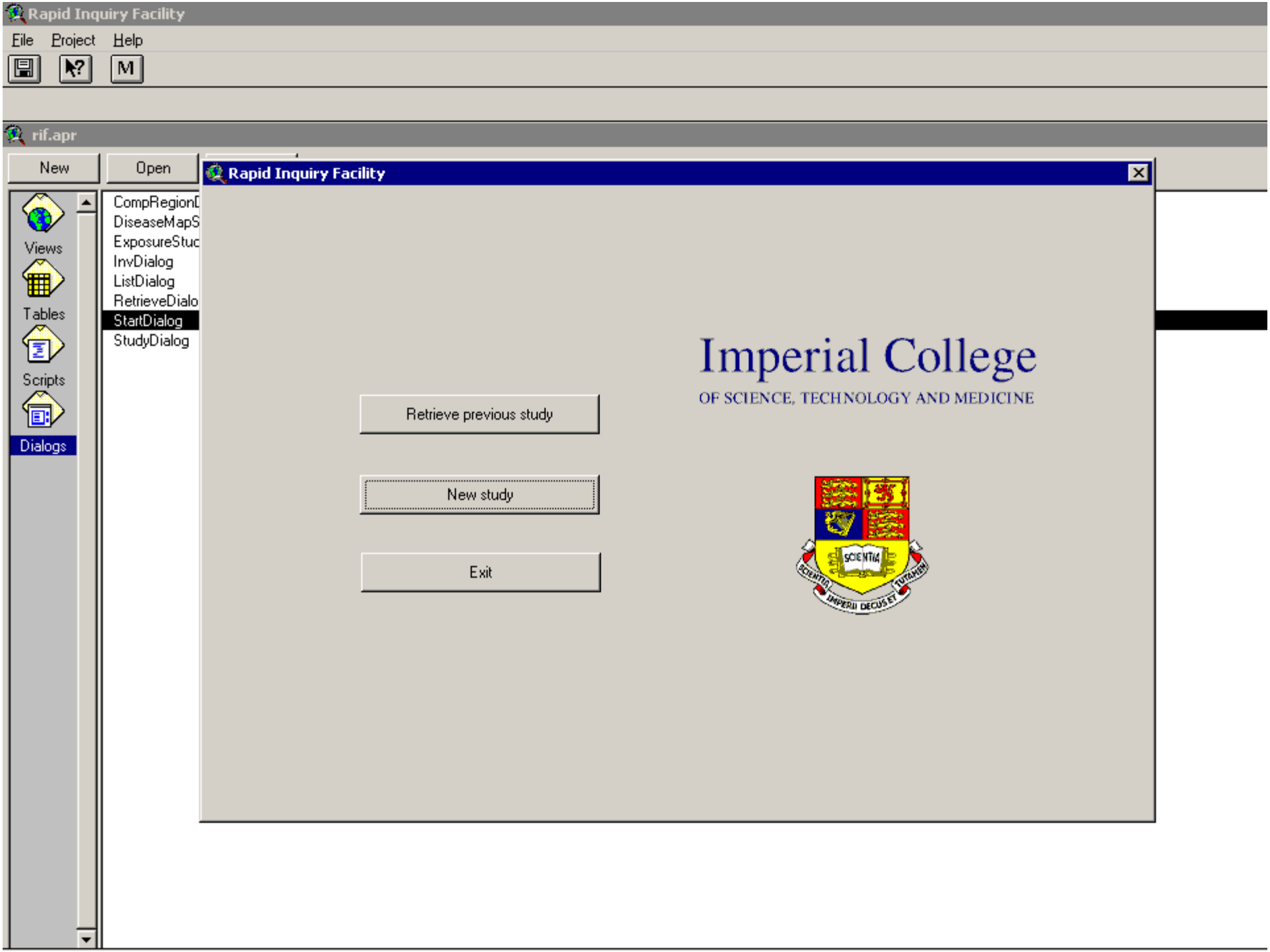
- Pros
  - point 'n' click, easy to use
  - many maps for area of concern
  - zones/buffer analysis
- Cons
  - high level of programming to maintain

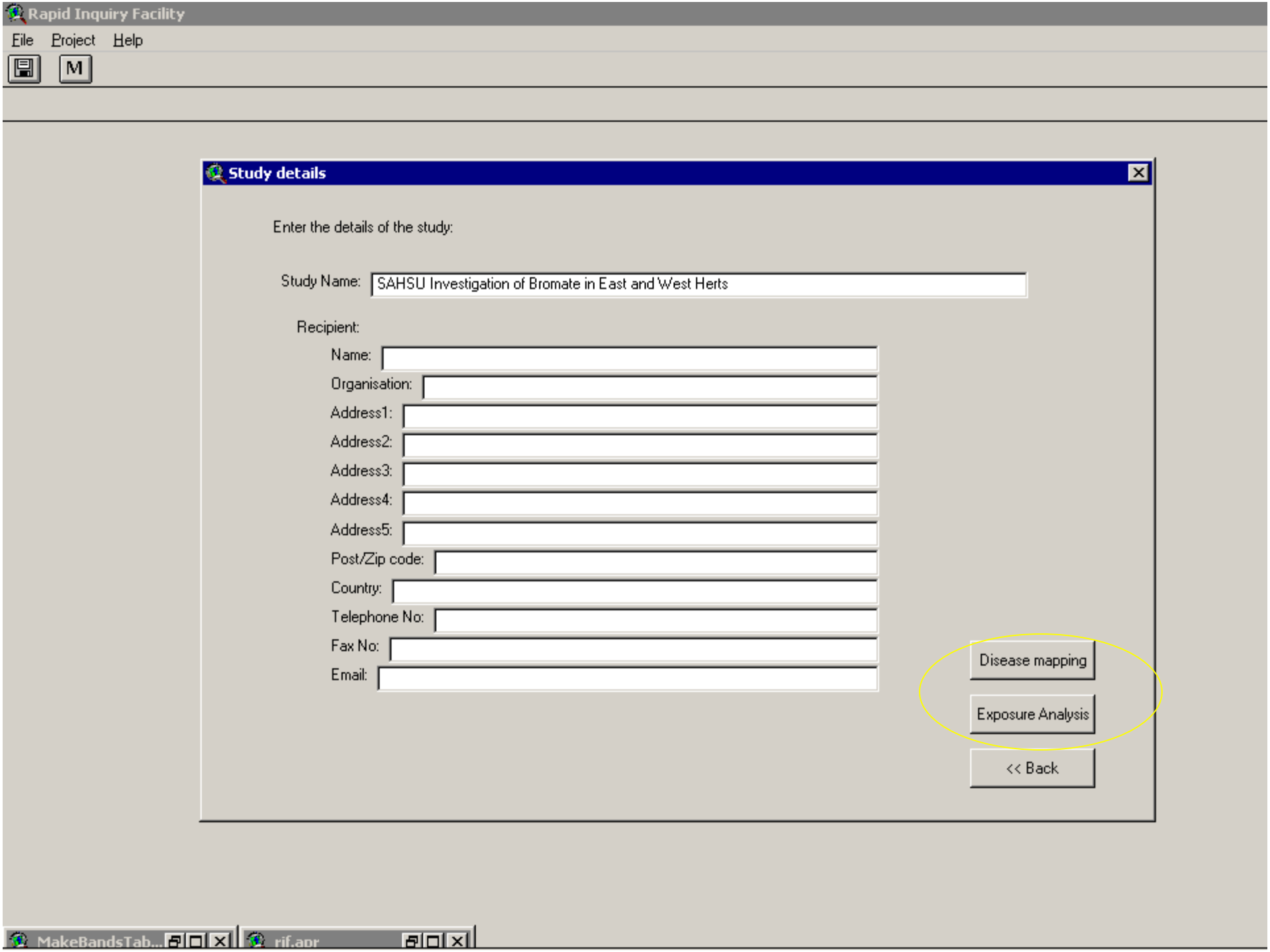
EUROHEIS RIF

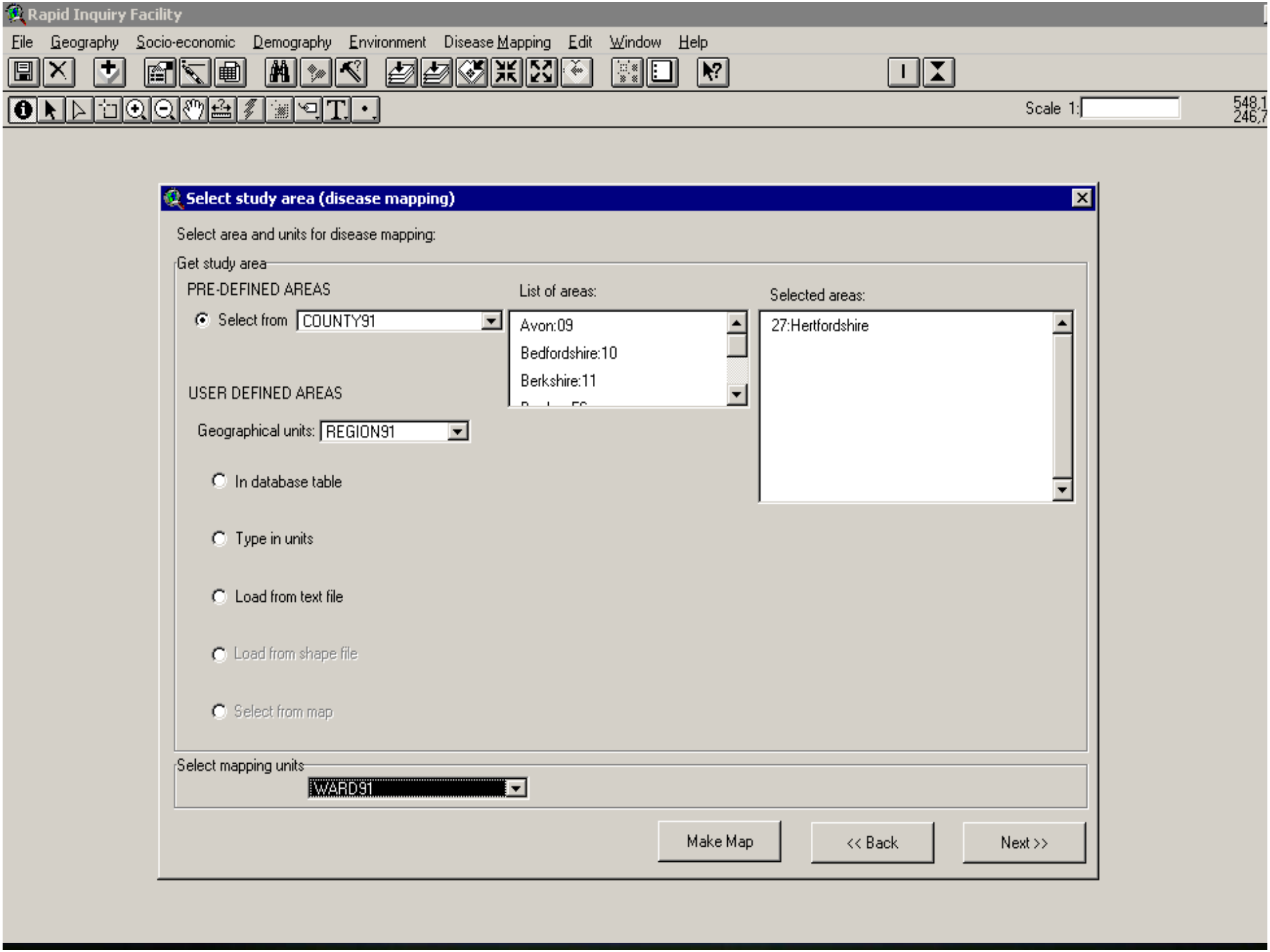
- Ported to Windows system
- Arc/View 3.2
  - Avenue scripts for "front end"
- ORACLE Personal 8i
  - Forms/Reports
- New system employs common and affordable software packages that can be run on a single machine

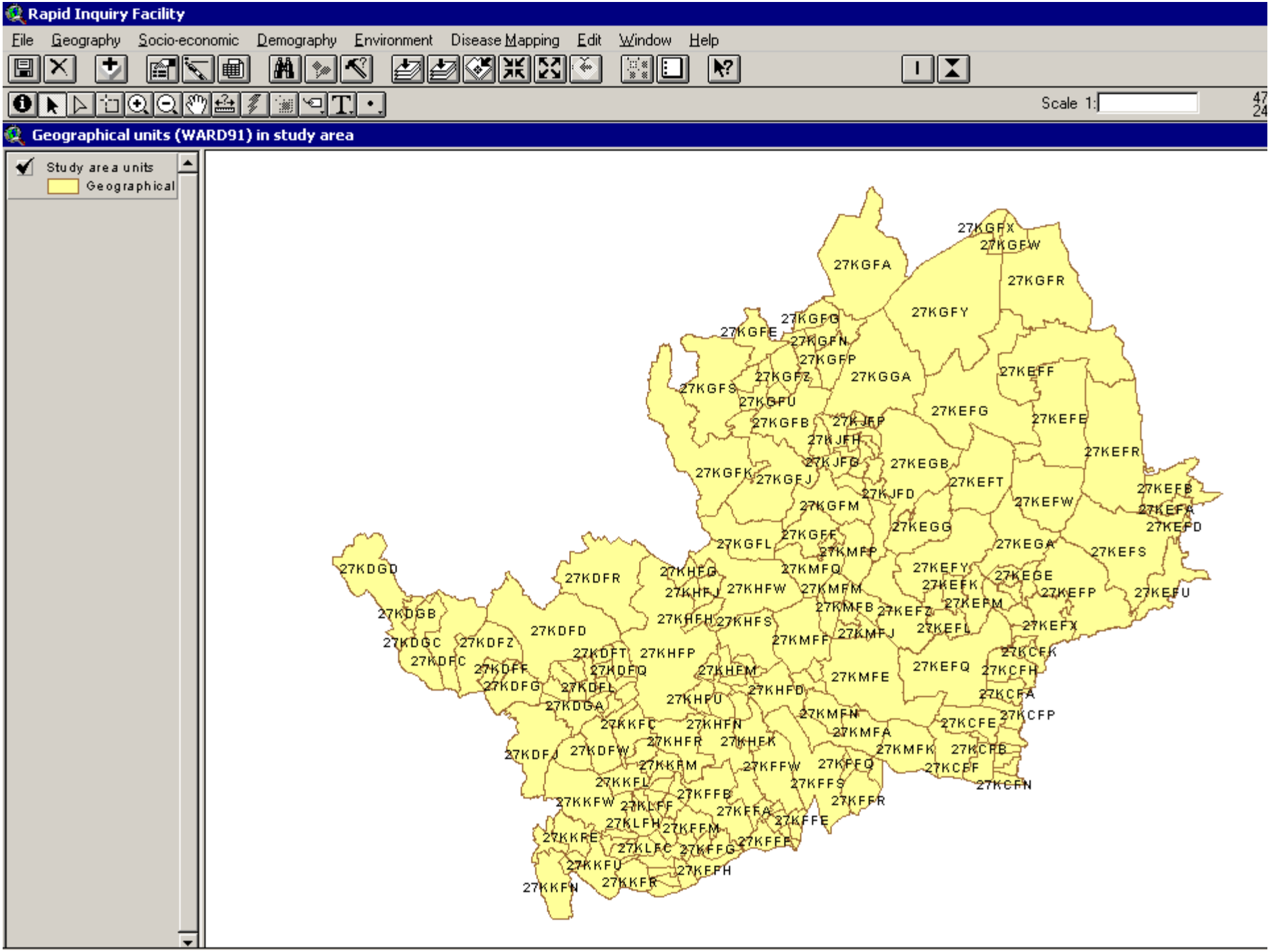
EUROHEIS RIF Schematic

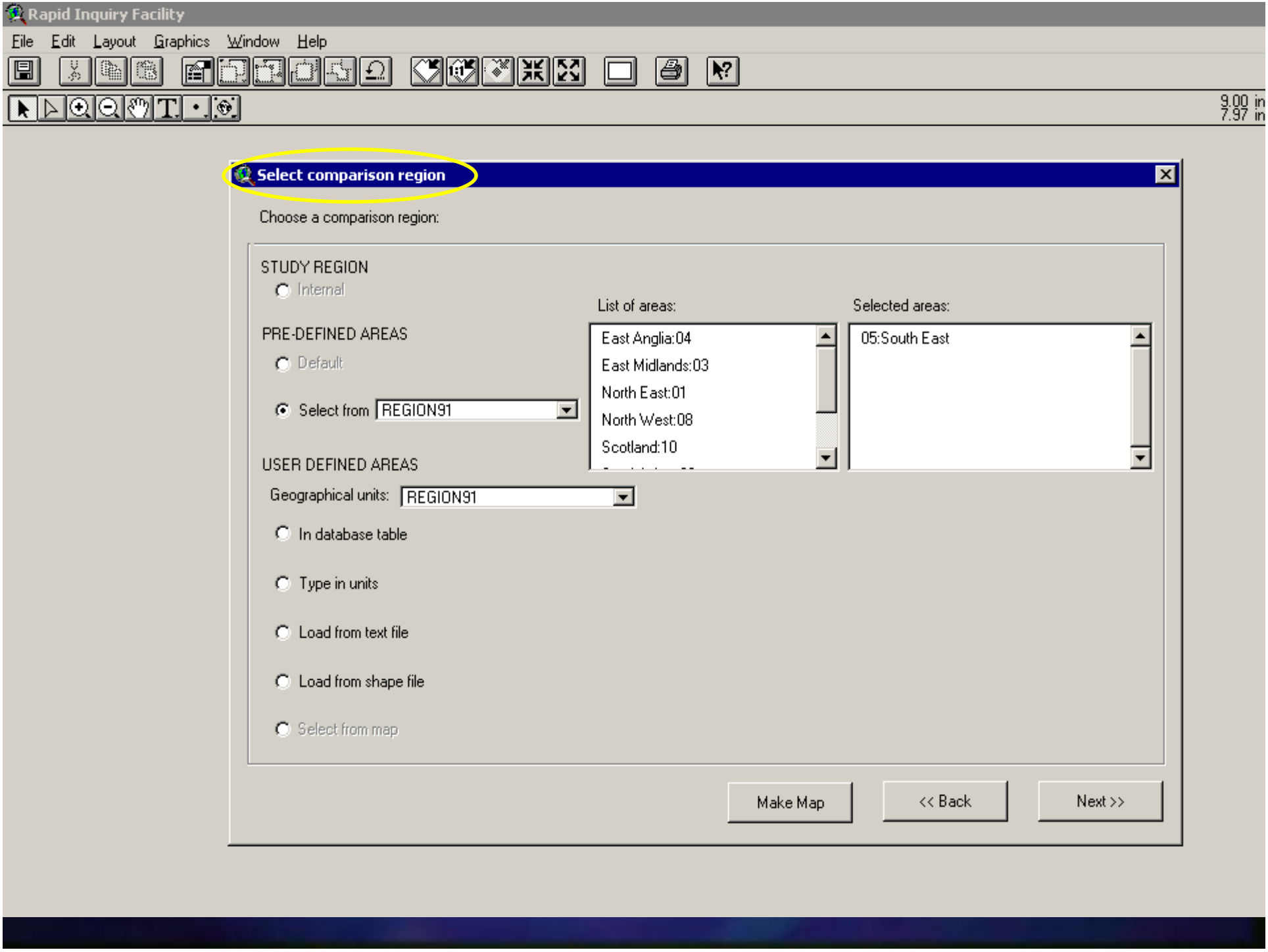


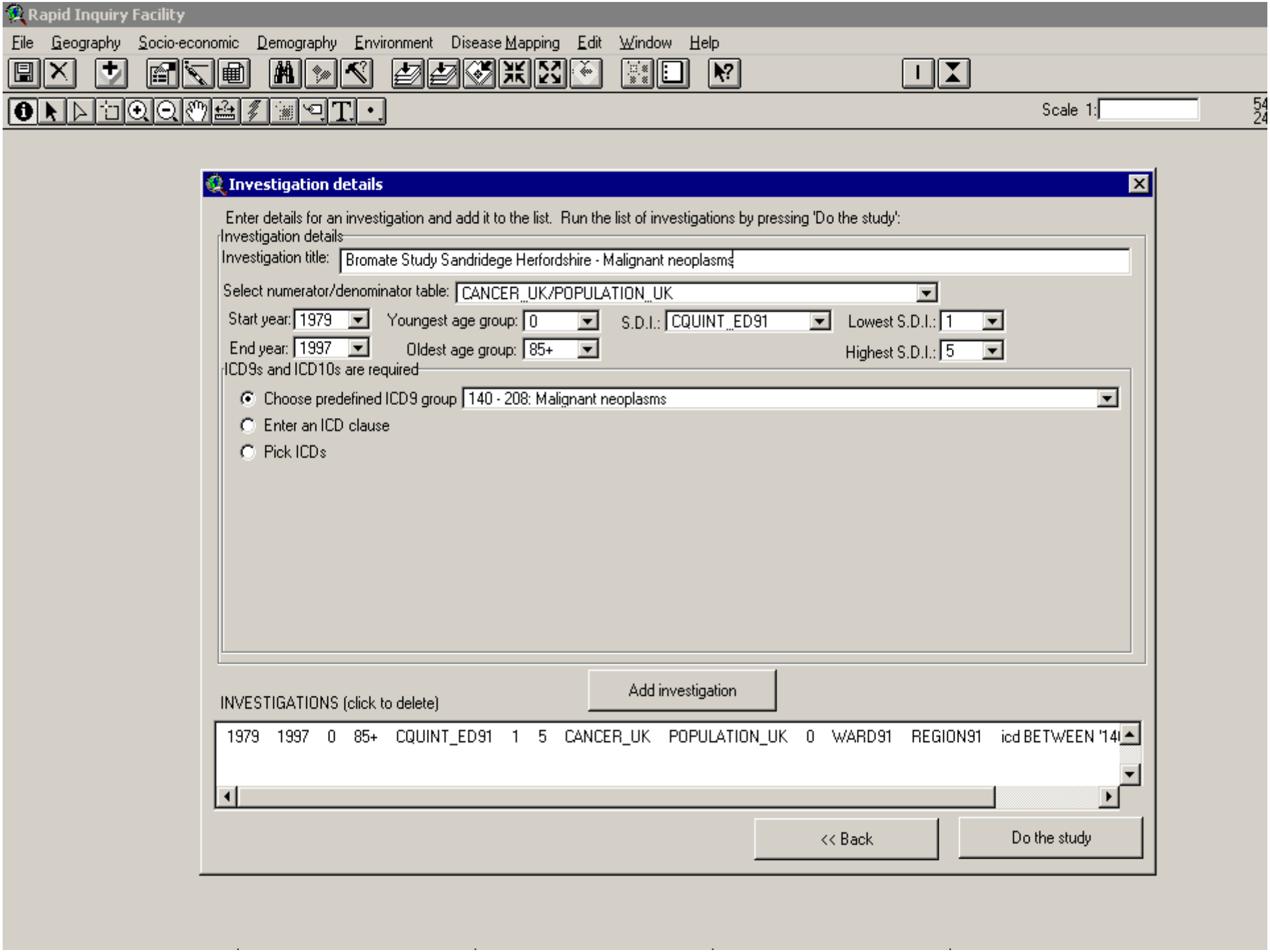

Rapid Inquiry Facility
File
Project
Help
M
rif.apr
New
Open
Views
Tables
Scripts
Dialogs
CompRegionD
DiseaseMapS
ExposureStuc
InvDialog
ListDialog
RetrieveDialo
StartDialog
StudyDialog
Rapid Inquiry Facility
Retrieve previous study
New study
Exit
Imperial College
OF SCIENCE, TECHNOLOGY AND MEDICINE
SCIENTIA
SCIENTIA IMPERII DECUS ET TUTAMEN


Rapid Inquiry Facility
File
Project
Help
M
Study details
Enter the details of the study:
Study Name:
SAHSU Investigation of Bromate in East and West Herts
Recipient:
Name:
Organisation:
Address1:
Address2:
Address3:
Address4:
Address5:
Post/Zip code:
Country:
Telephone No:
Fax No:
Email:
Disease mapping
Exposure Analysis
<< Back
MakeBandsTab...
rif.apr


Rapid Inquiry Facility
File Geography Socio-economic Demography Environment Disease Mapping Edit Window Help
Scale 1:
548,1
246,7
Select study area (disease mapping)
Select area and units for disease mapping:
Get study area
PRE-DEFINED AREAS
Select from COUNTY91
List of areas:
Avon:09
Bedfordshire:10
Berkshire:11
Selected areas:
27:Hertfordshire
USER DEFINED AREAS
Geographical units: REGION91
In database table
Type in units
Load from text file
Load from shape file
Select from map
Select mapping units
WARD91
Make Map
<< Back
Next >>


Rapid Inquiry Facility
File Geography Socio-economic Demography Environment Disease Mapping Edit Window Help
Scale 1:
Geographical units (WARD91) in study area
Study area units
Geographical
27KGFX
27KGFW
27KGFA
27KGFR
27KGFY
27KGFG
27KGFE
27KGFN
27KGFP
27KGFZ
27KGGA
27KGFS
27KGFU
27KGFB
27KJFP
27KJFH
27KJFG
27KEGB
27KGFK
27KGFJ
27KEFT
27KJFD
27KGFM
27KEFW
27KEGG
27KGFF
27KGFL
27KMFP
27KEGA
27KDGD
27KDFR
27KHFG
27KMFQ
27KEFY
27KEGE
27KHFJ
27KHFW
27KMFM
27KEFK
27KEFP
27KEFU
27KDGB
27KMFB
27KEFZ
27KEFM
27KHFH
27KHFS
27KDFD
27KMFF
27KMFJ
27KEFL
27KEFX
27KDGC
27KDFZ
27KDFT
27KHFP
27KCFK
27KDFC
27KDFF
27KDFQ
27KHFM
27KEFQ
27KCFH
27KDFG
27KDFL
27KHFD
27KMFE
27KCFA
27KDGA
27KHFU
27KMFN
27KCFP
27KKFC
27KHFN
27KMFA
27KCFE
27KHFR
27KHFK
27KMFK
27KCFB
27KDFJ
27KDFW
27KKFM
27KFFW
27KFFQ
27KCFF
27KKFL
27KFFS
27KCFN
27KFFB
27KKFW
27KLFF
27KFFR
27KFFA
27KLFH
27KFFM
27KFFE
27KKRE
27KLFC
27KFFG
27KFFF
27KKFU
27KFFH
27KKFR
27KKFN


Rapid Inquiry Facility
File Edit Layout Graphics Window Help
9.00 in
7.97 in
Select comparison region
Choose a comparison region:
STUDY REGION
Internal
PRE-DEFINED AREAS
Default
Select from REGION91
USER DEFINED AREAS
List of areas:
East Anglia:04
East Midlands:03
North East:01
North West:08
Scotland:10
Selected areas:
05:South East
Geographical units: REGION91
In database table
Type in units
Load from text file
Load from shape file
Select from map
Make Map
<< Back
Next >>


Rapid Inquiry Facility
File Geography Socio-economic Demography Environment Disease Mapping Edit Window Help
Scale 1:
Investigation details
Enter details for an investigation and add it to the list. Run the list of investigations by pressing 'Do the study':
Investigation details
Investigation title: Bromate Study Sandridege Herfordshire - Malignant neoplasms
Select numerator/denominator table: CANCER_UK/POPULATION_UK
Start year: 1979
Youngest age group: 0
S.D.I.: CQUINT_ED91
Lowest S.D.I.: 1
End year: 1997
Oldest age group: 85+
Highest S.D.I.: 5
ICD9s and ICD10s are required
Choose predefined ICD9 group 140 - 208: Malignant neoplasms
Enter an ICD clause
Pick ICDs
Add investigation
INVESTIGATIONS (click to delete)
1979 1997 0 85+ CQUINT_ED91 1 5 CANCER_UK POPULATION_UK 0 WARD91 REGION91 icd BETWEEN '14
<< Back
Do the study

Indirectly standardised rate ratios

Investigation: Bromate Investigation Sandridge Hertfordshire - Cancer Incidence in ages 0 to 85+ (1979-1997)

SDI standardised: No

Sex: Both

Zone	Observed	Expected	RR	CI - lower 95%	CI - upper 95%	Smoothed RR
Symonds Green (27KJFN)	384	400.509467	.958779	.867521	1.059637	.955739
Sherrards (27KMFM)	309	399.730926	.77302	.691459	.864201	.789727
Cheshunt North (27KCFD)	328	390.840851	.839216	.753136	.935135	.849081
Cheshunt Central (27KCFC)	295	280.4775	1.051778	.938349	1.178918	1.034143
Grove Hill (27KDFT)	304	266.755105	1.139622	1.018451	1.275209	1.107925
Tring West (27KDGD)	397	305.363882	1.300088	1.178288	1.434479	1.250234
Little Amwell (27KEFQ)	176	215.824994	.815476	.703474	.945309	.836182
Cowley (27KFFE)	393	374.14978	1.050381	.9515	1.159539	1.036821
Sarratt (27KKFW)	185	204.445199	.904888	.783451	1.045147	.909655
Mill (27KFFM)	282	294.812868	.956539	.851164	1.074959	.952872
Stapleford (27KEFY)	77	105.81875	.727659	.582	.909774	.790447
Aldenham West (27KFFB)	282	296.394055	.951436	.846624	1.069224	.948492
Tewin (27KEFZ)	121	145.99345	.828804	.693535	.990456	.853706
Hertford Bengeo (27KEFK)	323	399.521328	.808467	.724936	.901624	.821411
Highfield (27KDFU)	389	366.529938	1.061305	.960908	1.172192	1.04624
Peartree (27KMFL)	371	398.529691	.930922	.840853	1.030638	.930839
Hatfield North (27KMFF)	380	430.374797	.882951	.798491	.976345	.887648
Central (27KLFB)	374	301.553847	1.240243	1.120705	1.372531	1.197998
Bishop's Stortford Parsonage (27KEFC)	241	306.961404	.785115	.691993	.890769	.804571
Chipperfield (27KDFN)	122	126.580985	.96381	.807097	1.150951	.954615
Hatfield East (27KMFE)	394	467.262852	.843208	.763926	.930719	.85124
Callowland (27KLFA)	392	294.319192	1.331887	1.206353	1.470484	1.275999
Colney Heath (27KHFD)	199	287.620946	.691883	.602132	.795012	.725691
Royston West (27KGFX)	372	443.602858	.838588	.757557	.928287	.847454
Waltham Cross North (27KCFM)	284	290.266993	.97841	.870984	1.099085	.971615
Monkswood (27KJFG)	267	253.525319	1.053149	.934106	1.187363	1.033719
Potters Bar West (27KFFS)	319	319.528164	.998347	.894587	1.114142	.989511
Campions (27KFFD)	222	183.383007	1.210581	1.061363	1.380778	1.152828
Hunsdon (27KEEP)	146	182.350583	.800656	.680767	.941657	.827442

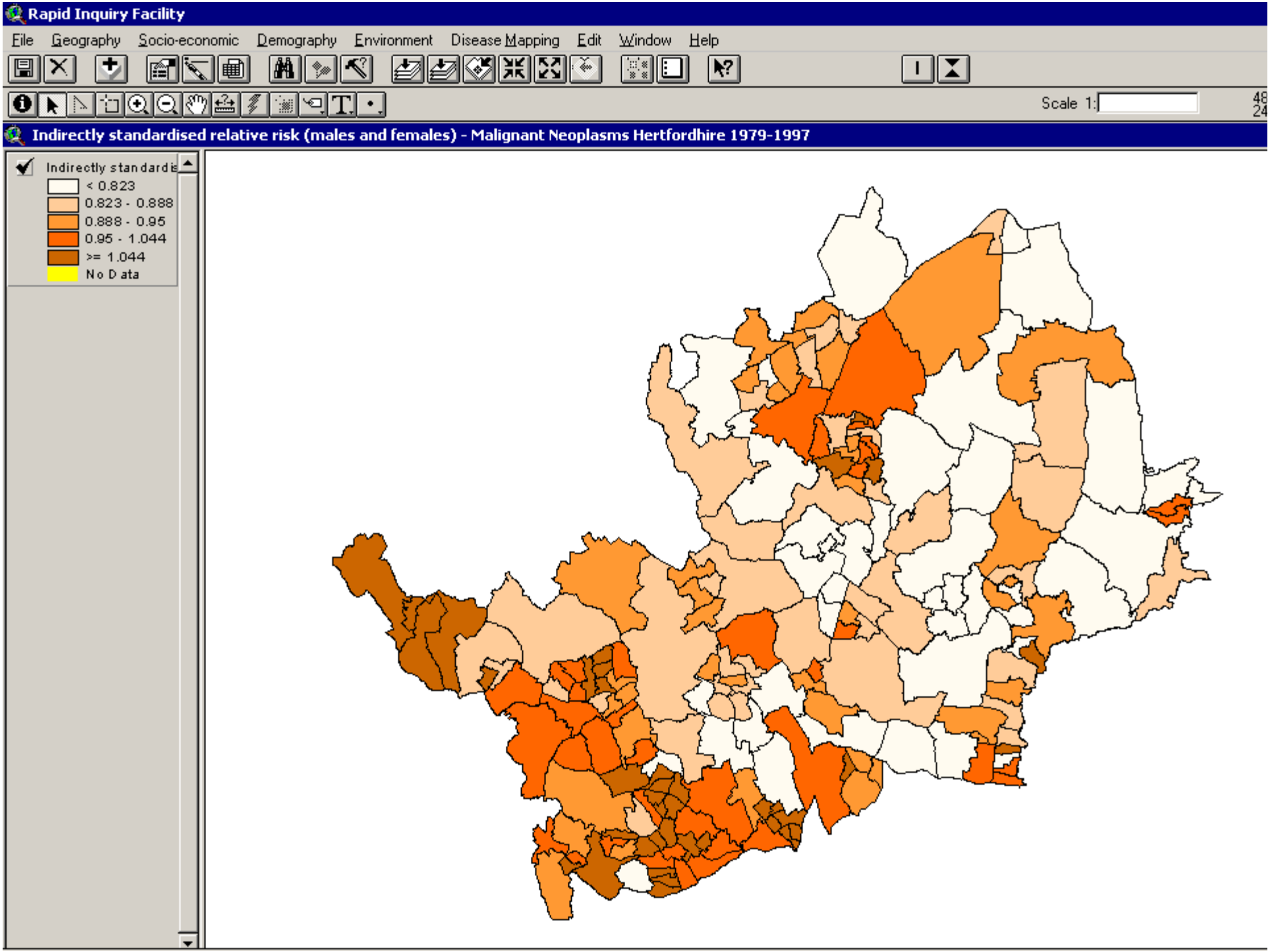
Directly standardised rates

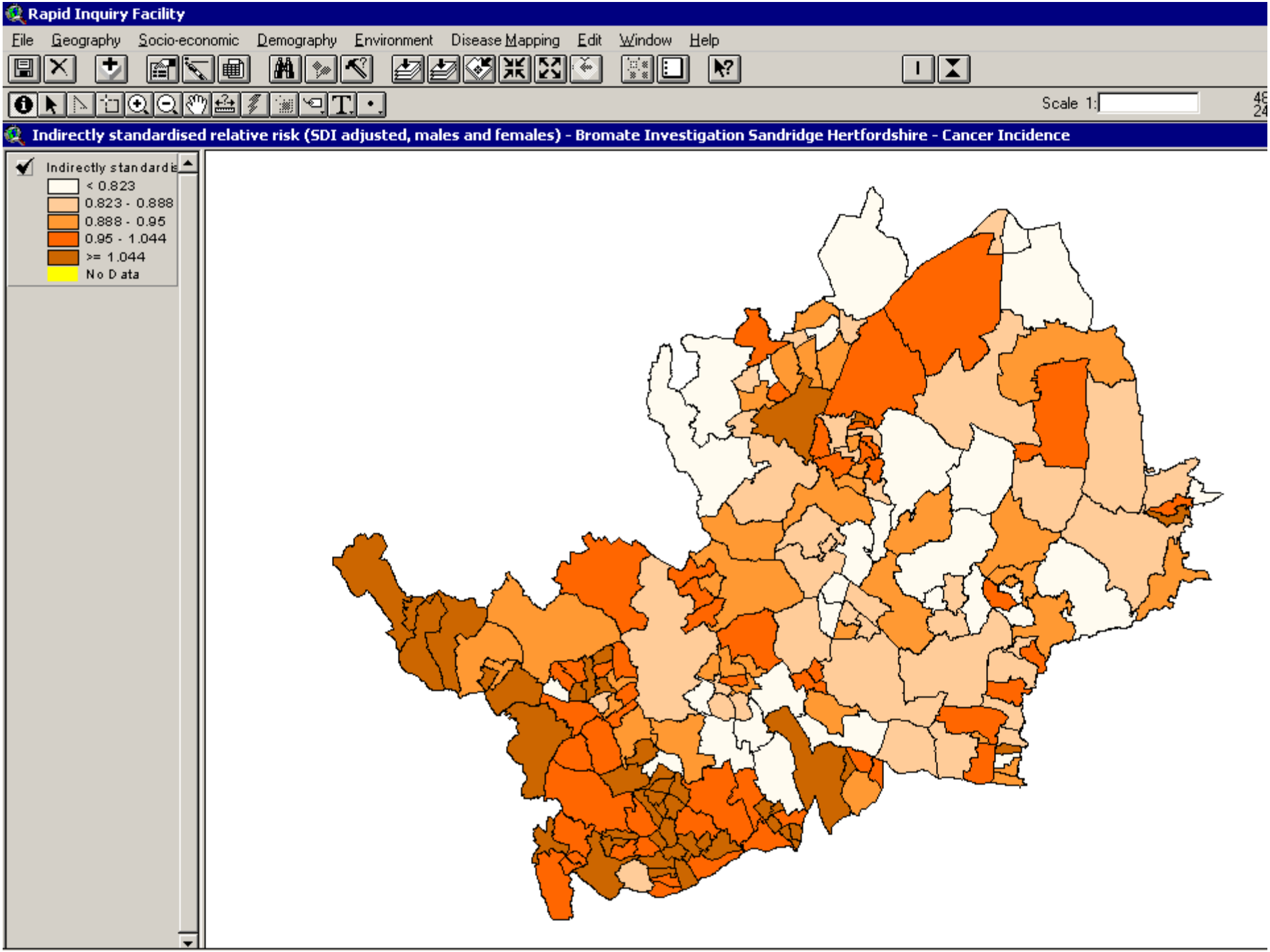
Investigation: Bromate Investigation Sandridge Hertfordshire - Cancer Incidence in ages 0 to 85+ (1979-1997)

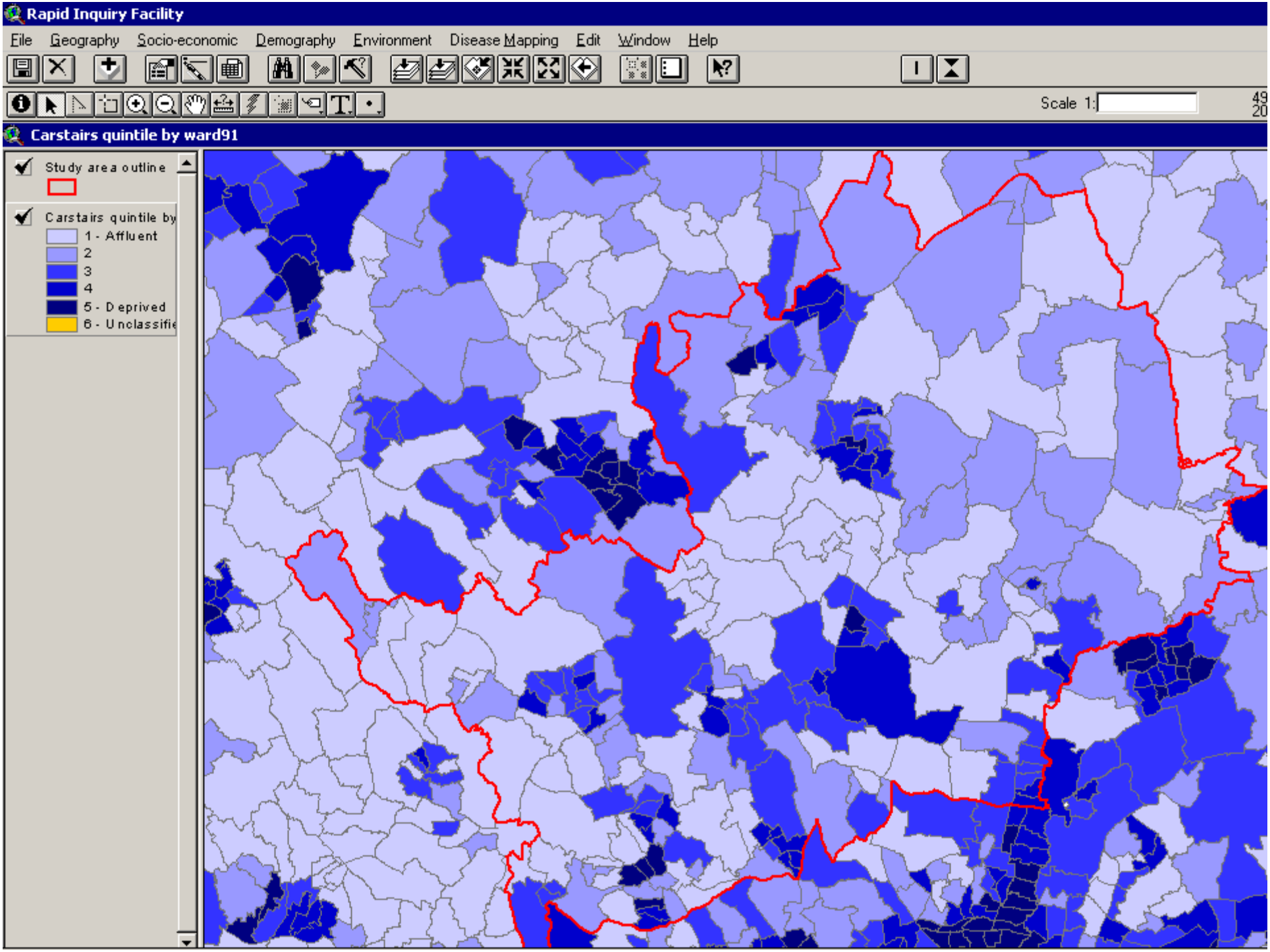
SDI standardised: ***Yes***

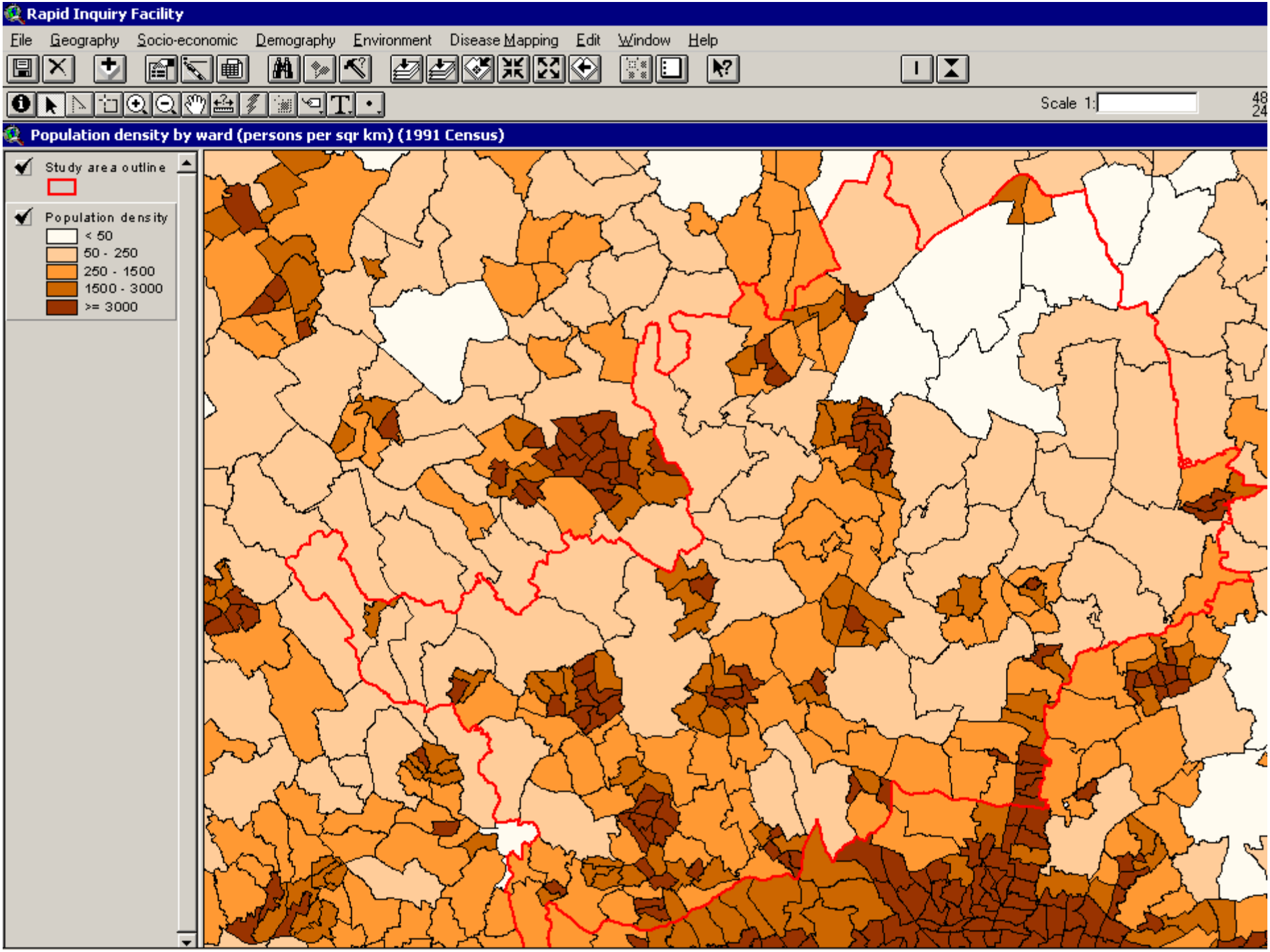
Sex: Both

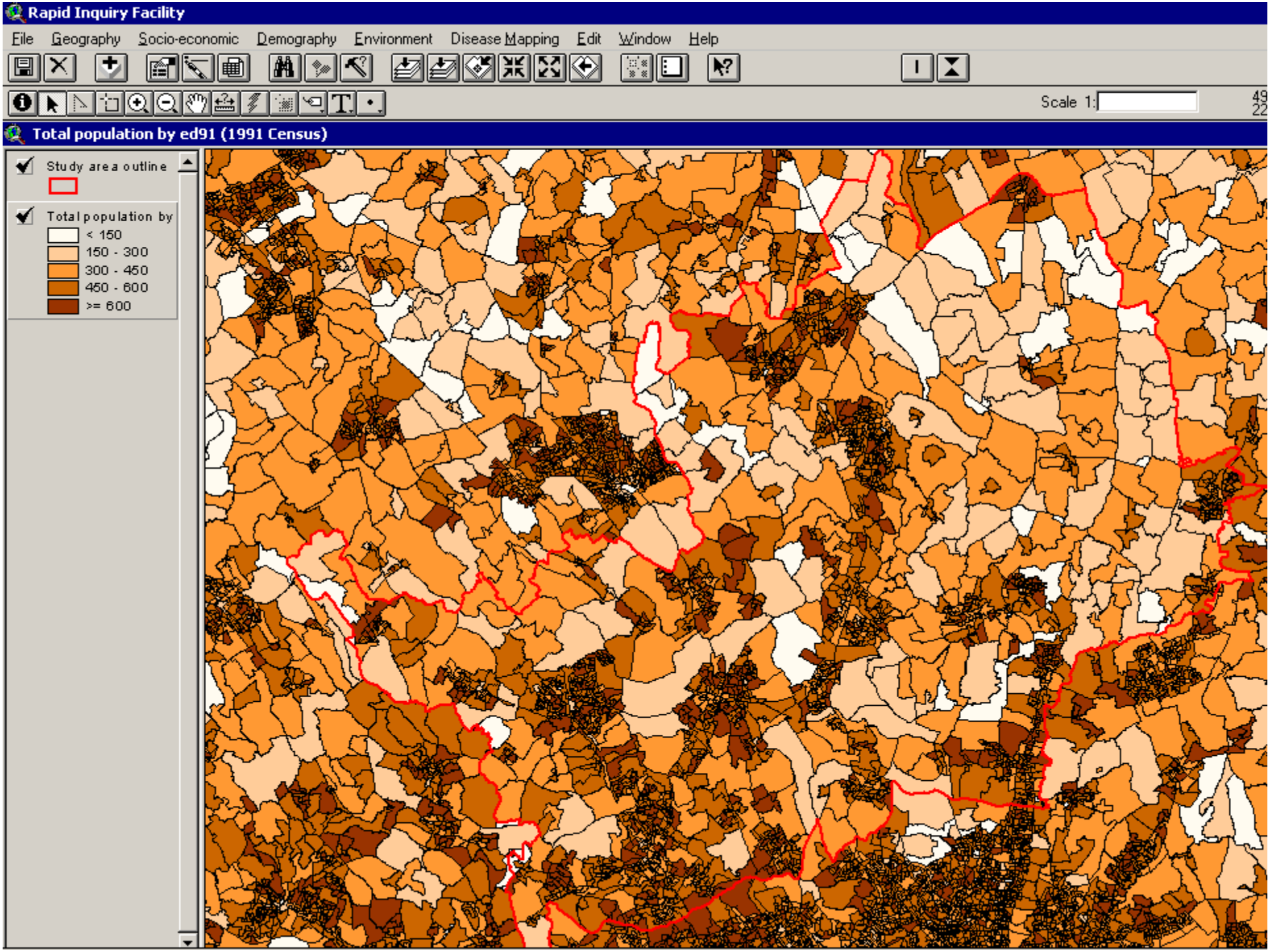
Zone	Rate (per 100,000pyrs)	No.of events	CI - lower 95%	CI - upper 95%
Sopwell (27KHFT)	258.736442	397	233.907934	285.483134
Sandridge (27KHFS)	192.386399	209	167.186403	220.312345
Cunningham (27KHFE)	290.552342	348	260.82373	322.740888
Letchworth East (27KGFN)	199.141698	377	179.544579	220.294081
Hitchwood (27KGFJ)	83.085492	96	67.299526	101.461614
Shenley (27KFFW)	64.83469	114	53.480627	77.886256
Wellfield (27KJFP)	208.95967	74	164.078318	262.329761
Marshalswick South (27KHFM)	255.15814	385	230.30402	281.963266
Brookmeadow (27KFFC)	170.625932	351	153.240649	189.443379
Thundridge (27KEGA)	205.647207	92	165.780688	252.208097
St.James East (27KFFT)	224.118848	303	199.591455	250.828352
Kenilworth (27KFFK)	252.053102	325	225.391853	281.00088
Warners End (27KDGE)	186.138468	383	167.961327	205.746392
Hillside (27KFFJ)	164.212387	319	146.684662	183.258018
Tring West (27KDGD)	364.375035	397	329.409382	402.04204
Hertford Bengeo (27KEFK)	148.66269	323	132.890497	165.791915
Harpenden North (27KHFG)	264.105868	414	239.274862	290.81371
Highbury (27KGFH)	273.596361	391	247.146318	302.106032
St.James West (27KFFU)	112.488646	301	100.138322	125.941507
Ware Priory (27KEGD)	201.889919	211	175.566304	231.046796
Stanstead (27KEFX)	245.205284	147	207.169407	288.202263
South (27KDGA)	191.801915	210	166.736229	219.572207
Woodside (27KLFM)	321.876663	510	294.543945	351.063359
Datchworth (27KEFH)	137.677268	75	108.291903	172.57962
Cupid Green (27KDFQ)	361.674961	165	308.594051	421.265316
Crabtree (27KDFP)	279.277291	369	251.505615	309.277784
Handside (27KMFC)	144.372923	417	130.846808	158.91762
Callowland (27KLFA)	201.245962	392	181.814624	222.188374
Pin Green (27KJFJ)	151.634753	264	133.89338	171.072851

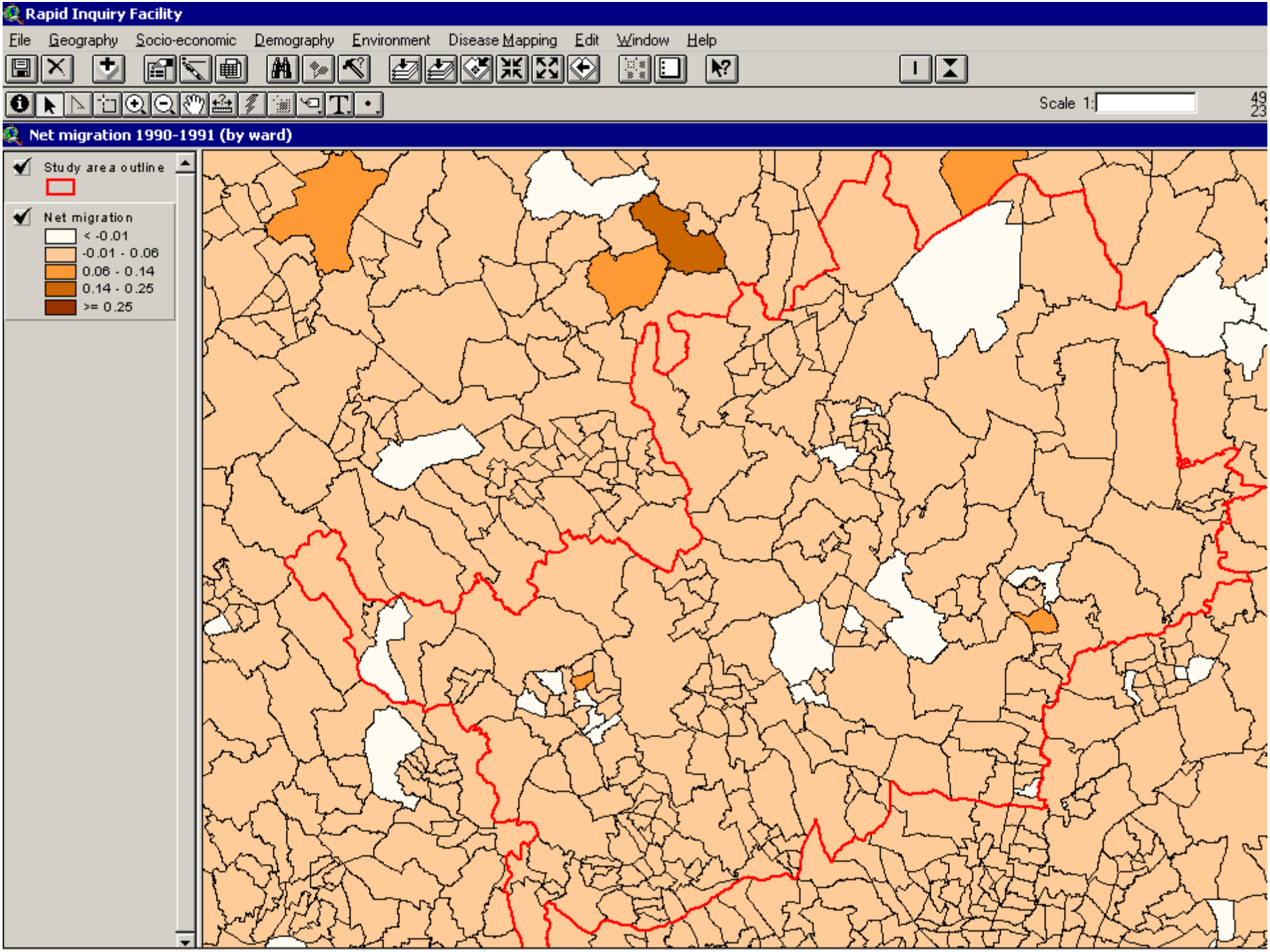

Rapid Inquiry Facility
File Geography Socio-economic Demography Environment Disease Mapping Edit Window Help
Scale 1:
Indirectly standardised relative risk (males and females) - Malignant Neoplasms Hertfordhire 1979-1997
Indirectly standardis
< 0.823
0.823 - 0.888
0.888 - 0.95
0.95 - 1.044
>= 1.044
No Data

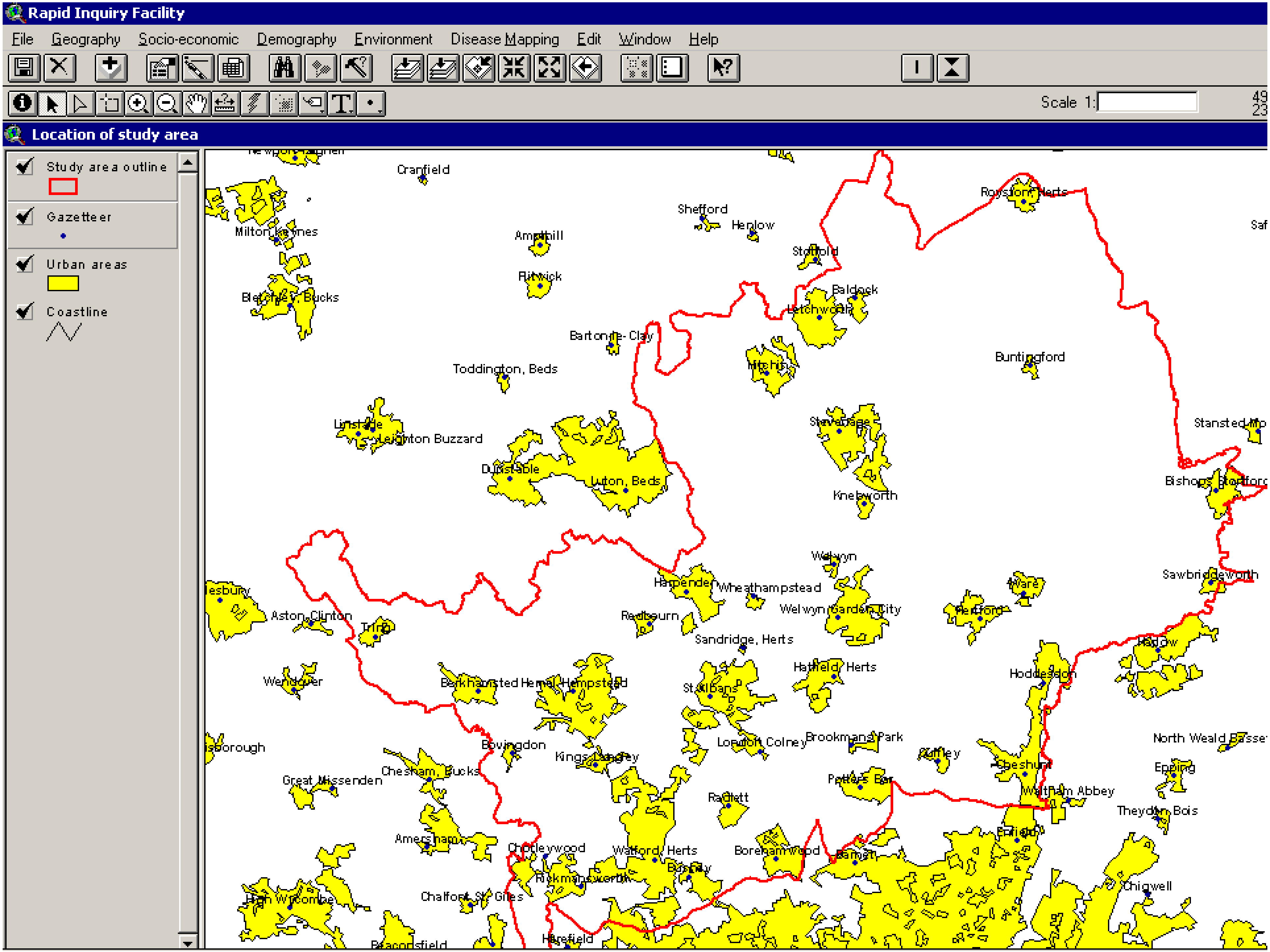

Rapid Inquiry Facility
File Geography Socio-economic Demography Environment Disease Mapping Edit Window Help
Scale 1:
Indirectly standardised relative risk (SDI adjusted, males and females) - Bromate Investigation Sandridge Hertfordshire - Cancer Incidence
Indirectly standardis
< 0.823
0.823 - 0.888
0.888 - 0.95
0.95 - 1.044
>= 1.044
No Data

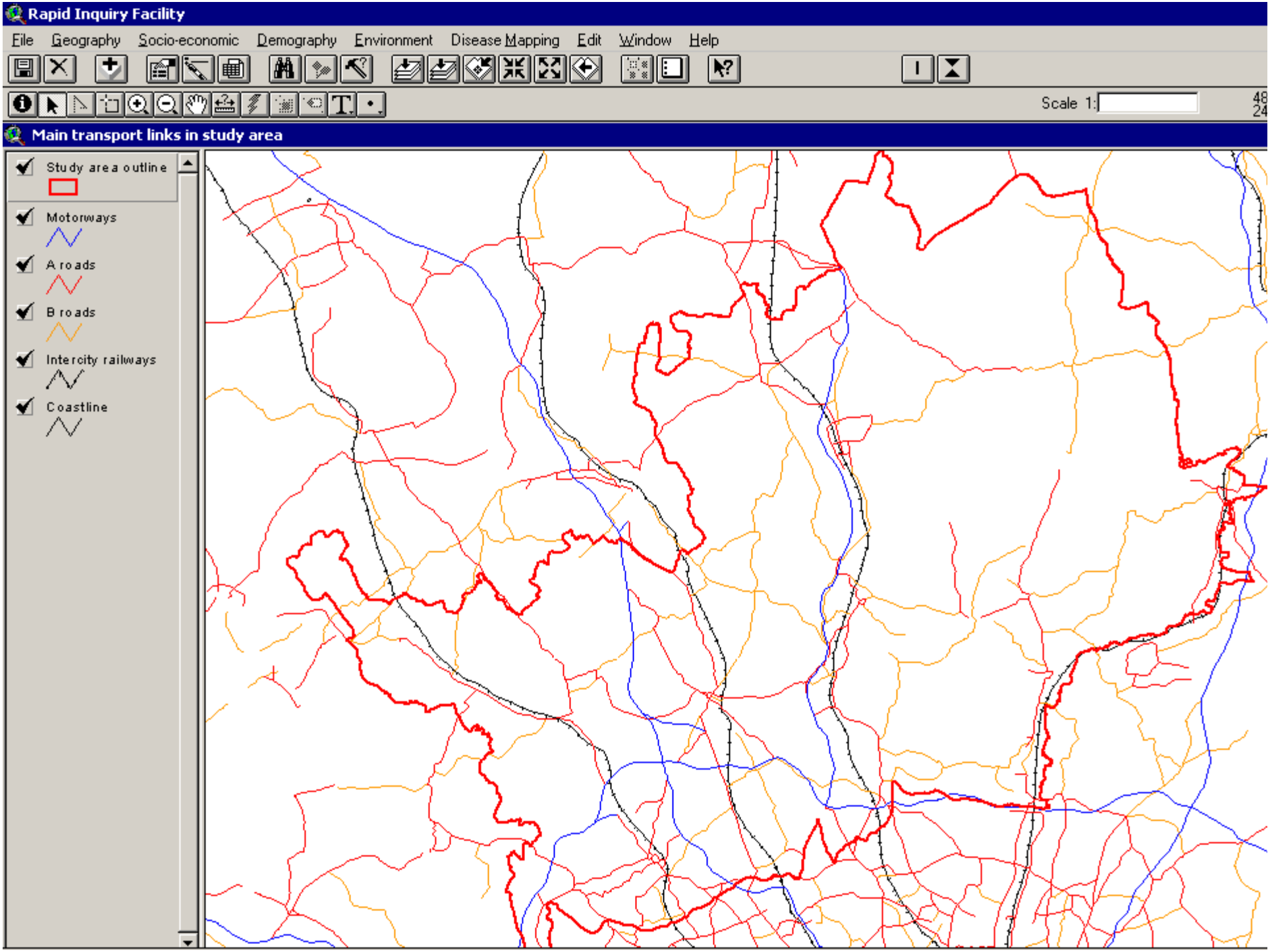

Rapid Inquiry Facility
File Geography Socio-economic Demography Environment Disease Mapping Edit Window Help
Scale 1:
Carstairs quintile by ward91
Study area outline
Carstairs quintile by
1 - Affluent
2
3
4
5 - Deprived
6 - Unclassifie

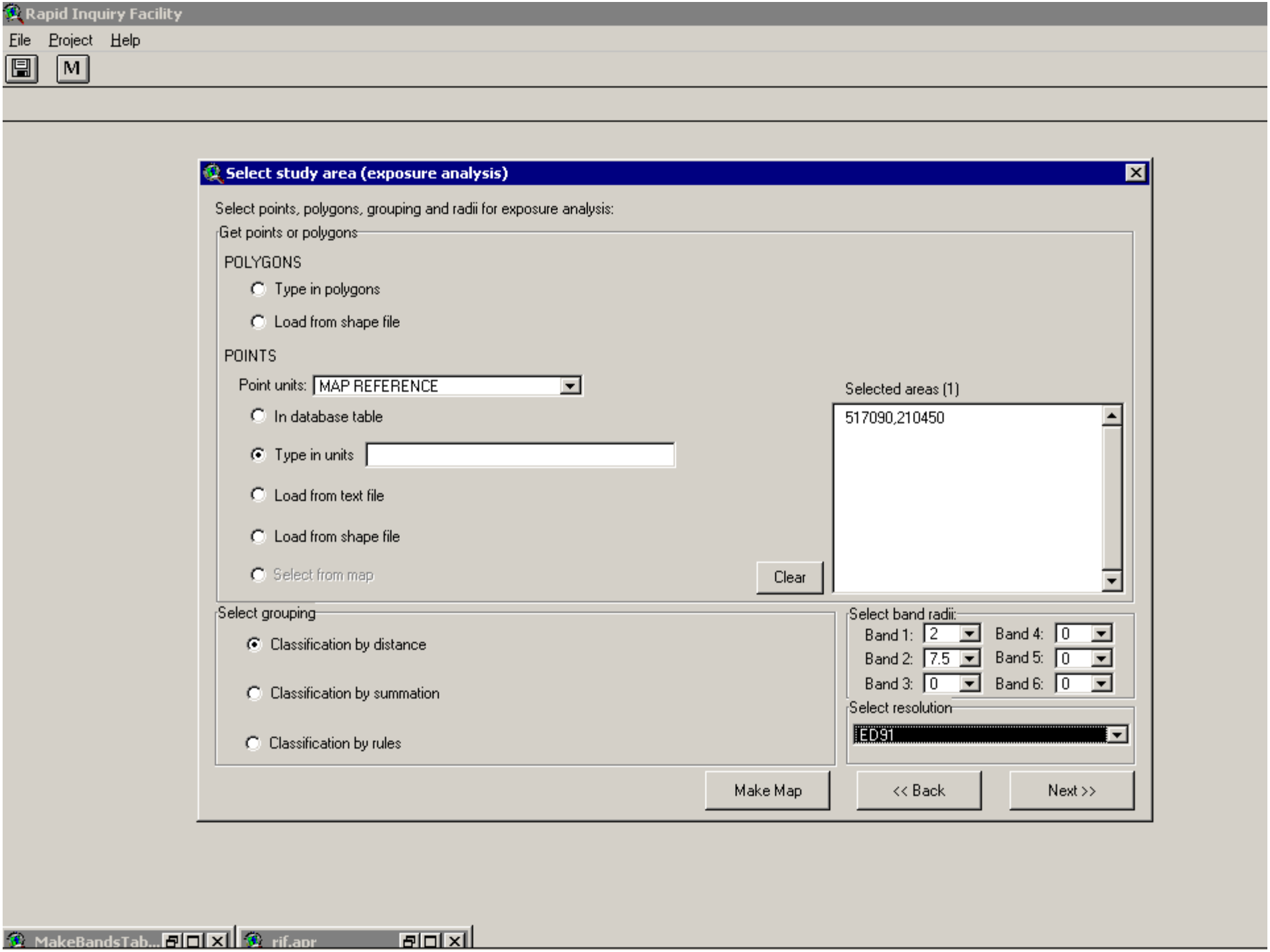

Rapid Inquiry Facility
File Geography Socio-economic Demography Environment Disease Mapping Edit Window Help
Scale 1:
Population density by ward (persons per sqr km) (1991 Census)
Study area outline
Population density
< 50
50 - 250
250 - 1500
1500 - 3000
>= 3000

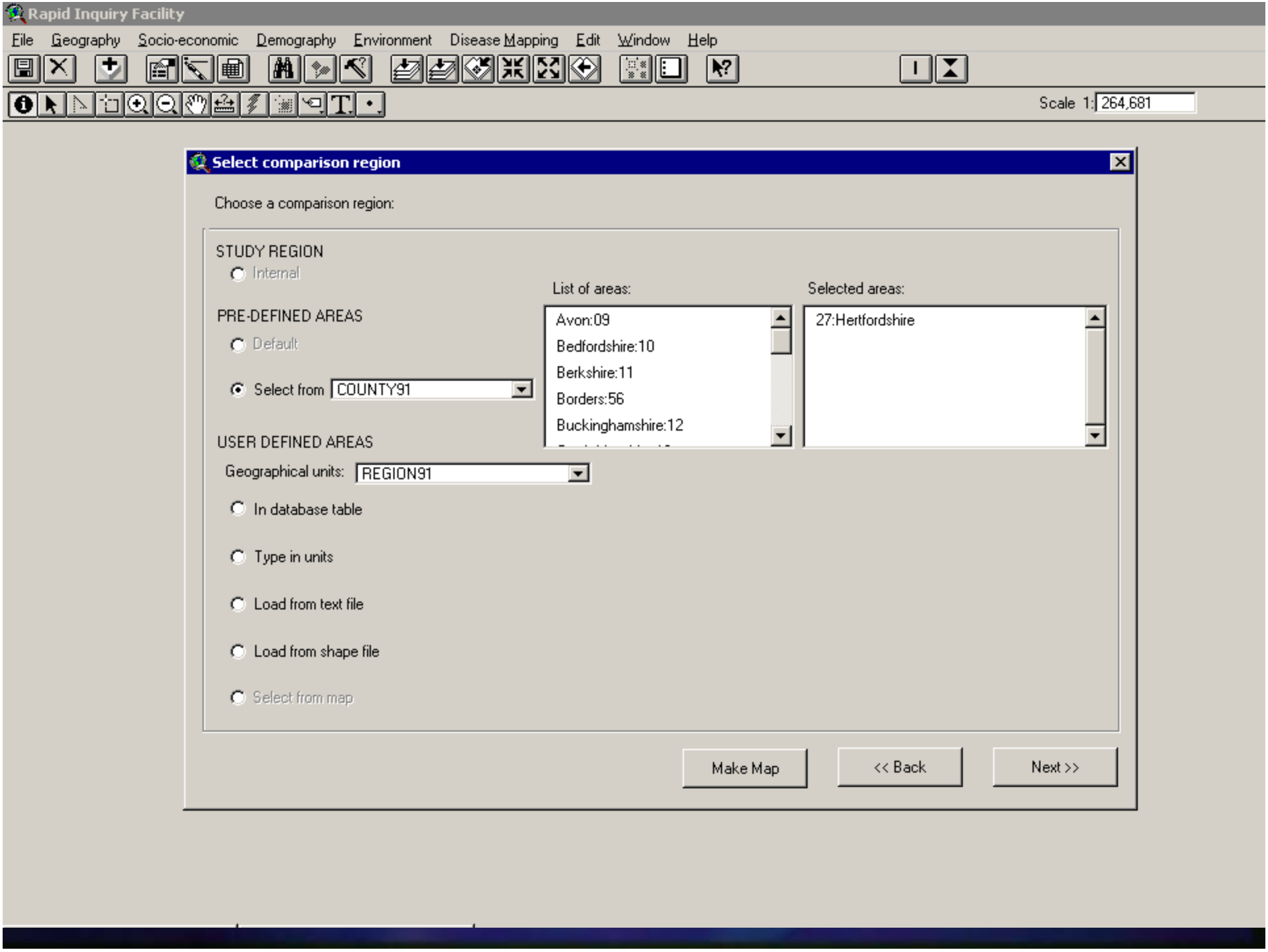

Rapid Inquiry Facility
File Geography Socio-economic Demography Environment Disease Mapping Edit Window Help
Scale 1:
Total population by ed91 (1991 Census)
Study area outline
Total population by
< 150
150 - 300
300 - 450
450 - 600
>= 600

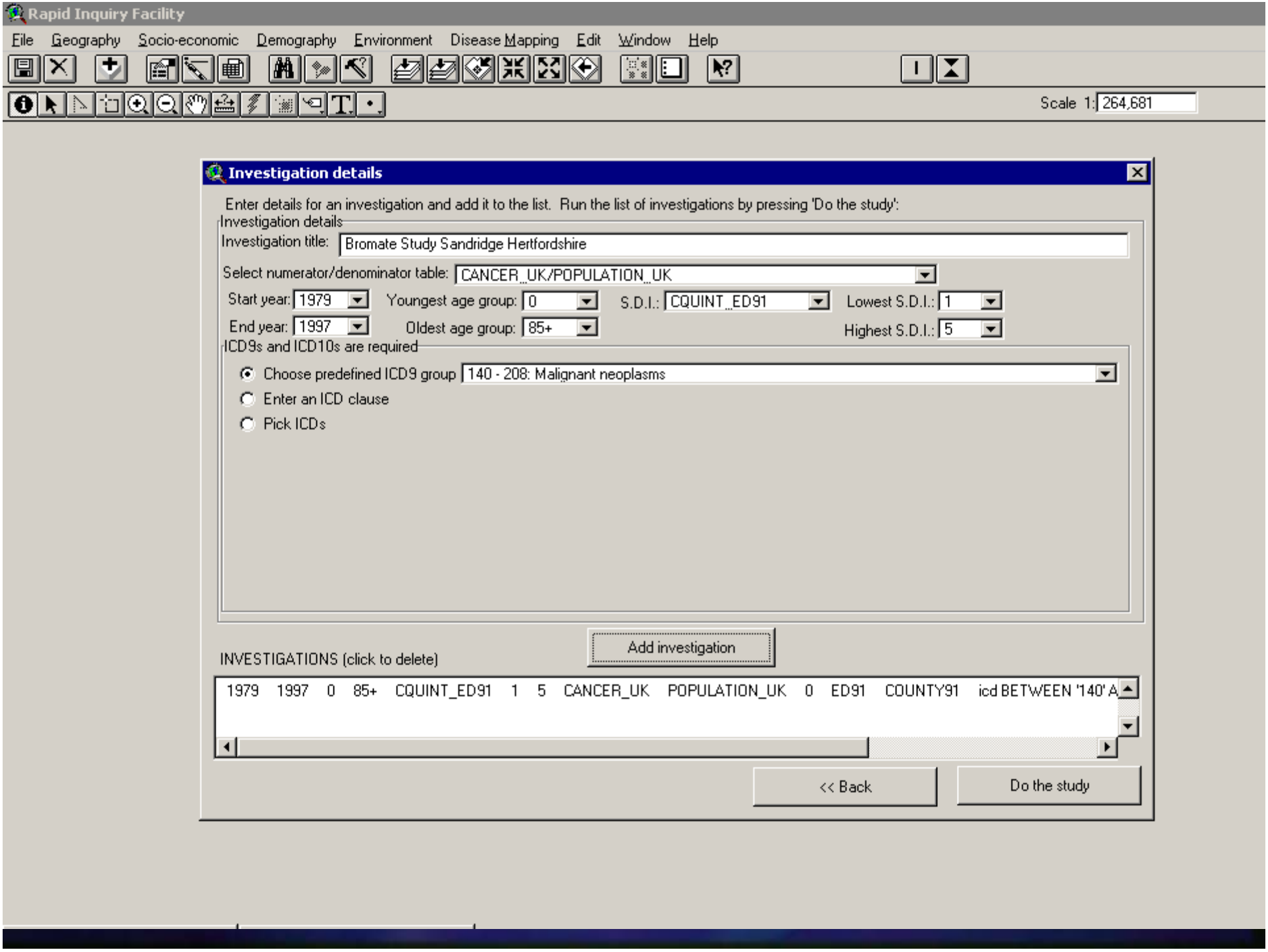

Rapid Inquiry Facility
File Geography Socio-economic Demography Environment Disease Mapping Edit Window Help
Scale 1:
Net migration 1990-1991 (by ward)
Study area outline
Net migration
< -0.01
-0.01 - 0.06
0.06 - 0.14
0.14 - 0.25
>= 0.25


Rapid Inquiry Facility
File
Geography
Socio-economic
Demography
Environment
Disease Mapping
Edit
Window
Help
Scale 1:
Location of study area
Study area outline
Gazetteer
Urban areas
Coastline
Cranfield
Milton Keynes
Bletchley, Bucks
Ampthill
Flitwick
Shefford
Henlow
Stotfold
Royston, Herts
Baldock
Letchworth
Barton-le-Clay
Toddington, Beds
Hitchin
Buntingford
Linslade
Leighton Buzzard
Dunstable
Luton, Beds
Stevenage
Knebworth
Stansted Mo
Bishops Stortford
Welwyn
Harpenden
Wheathampstead
Welwyn Garden City
Ware
Hertford
Sawbridgeworth
Aston Clinton
Tring
Redbourn
Sandridge, Herts
Harlow
Wendover
Berkhamsted
Hemel Hempstead
St Albans
Hatfield, Herts
Hoddesdon
Bovingdon
Kings Langley
London Colney
Brookmans Park
Cuffley
Cheshunt
North Weald Basse
Epping
Great Missenden
Chesham, Bucks
Potters Bar
Radlett
Waltham Abbey
Theydon Bois
Amersham
Chorleywood
Rickmansworth
Watford, Herts
Bushey
Borehamwood
Barnet
Enfield
Chigwell
High Wycombe
Chalfont St Giles
Beaconsfield
Harefield


Rapid Inquiry Facility
File Geography Socio-economic Demography Environment Disease Mapping Edit Window Help
Scale 1:
Main transport links in study area
Study area outline
Motorways
A roads
B roads
Intercity railways
Coastline


Rapid Inquiry Facility
File
Project
Help
M
Select study area (exposure analysis)
Select points, polygons, grouping and radii for exposure analysis:
Get points or polygons
POLYGONS
Type in polygons
Load from shape file
POINTS
Point units:
MAP REFERENCE
In database table
Type in units
Load from text file
Load from shape file
Select from map
Clear
Selected areas (1)
517090,210450
Select grouping
Classification by distance
Classification by summation
Classification by rules
Select band radii:
Band 1:
2
Band 2:
7.5
Band 3:
0
Band 4:
0
Band 5:
0
Band 6:
0
Select resolution
ED91
Make Map
<< Back
Next >>
MakeBandsTab...
rif.apr


Rapid Inquiry Facility
File Geography Socio-economic Demography Environment Disease Mapping Edit Window Help
Scale 1: 264,681
Select comparison region
Choose a comparison region:
STUDY REGION
Internal
PRE-DEFINED AREAS
Default
Select from COUNTY91
USER DEFINED AREAS
Geographical units: REGION91
In database table
Type in units
Load from text file
Load from shape file
Select from map
List of areas:
Avon:09
Bedfordshire:10
Berkshire:11
Borders:56
Buckinghamshire:12
Selected areas:
27:Hertfordshire
Make Map
<< Back
Next >>

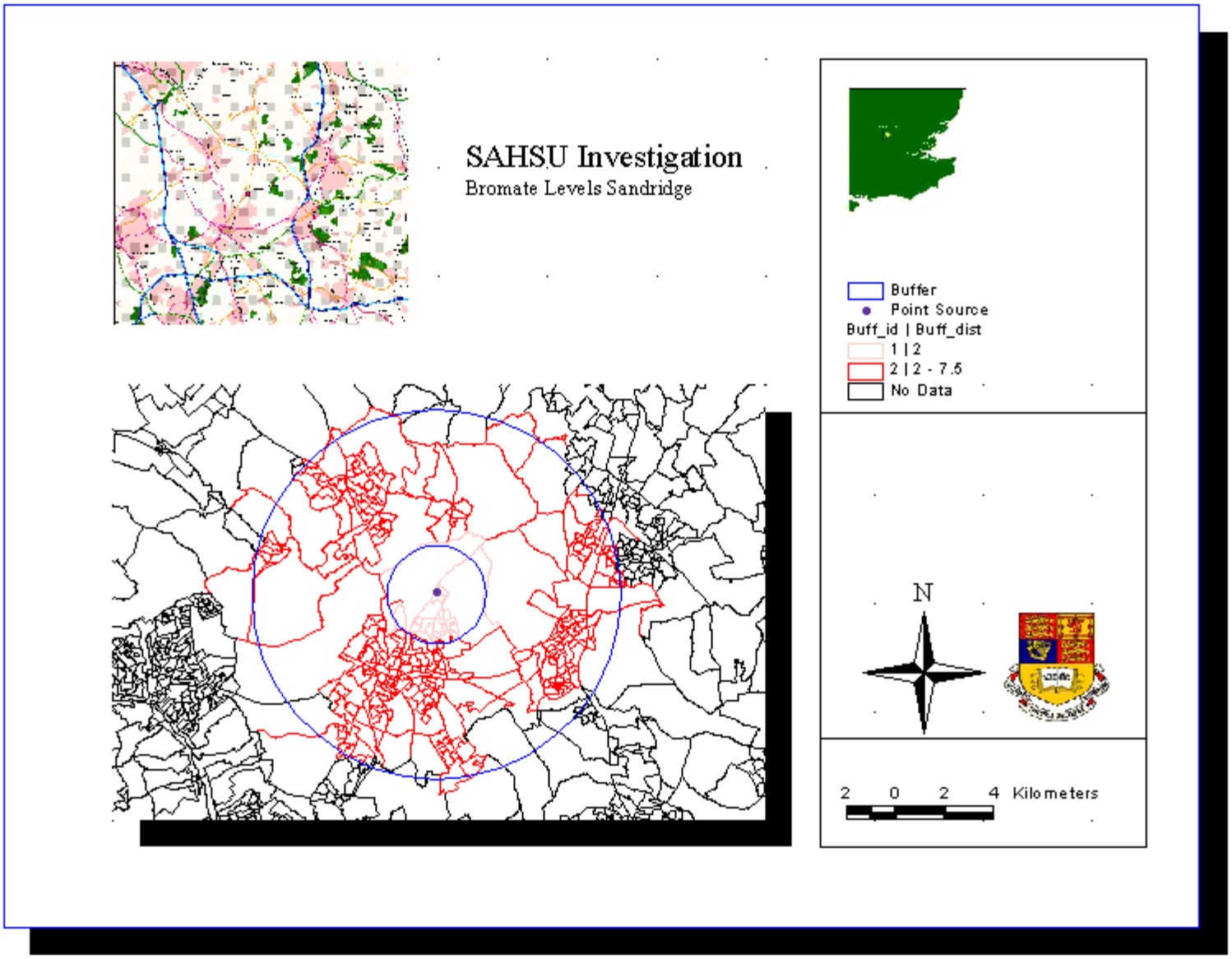

Rapid Inquiry Facility
File Geography Socio-economic Demography Environment Disease Mapping Edit Window Help
Scale 1: 264,681
Investigation details
Enter details for an investigation and add it to the list. Run the list of investigations by pressing 'Do the study':
Investigation details
Investigation title: Bromate Study Sandridge Hertfordshire
Select numerator/denominator table: CANCER_UK/POPULATION_UK
Start year: 1979
Youngest age group: 0
S.D.I.: CQUINT_ED91
Lowest S.D.I.: 1
End year: 1997
Oldest age group: 85+
Highest S.D.I.: 5
ICD9s and ICD10s are required
Choose predefined ICD9 group 140 - 208: Malignant neoplasms
Enter an ICD clause
Pick ICDs
Add investigation
INVESTIGATIONS (click to delete)
1979 1997 0 85+ CQUINT_ED91 1 5 CANCER_UK POPULATION_UK 0 ED91 COUNTY91 icd BETWEEN '140' A
<< Back
Do the study

Rapid Inquiry Facility

File Edit Layout Graphics Window Help

-0.59 in
8.53 in

View5 Layout



Indirectly standardised rate ratios

Investigation: Bromate Investigation Sandridge - Malignant Neoplasms in ages 0 to 85+ (1979-1997)

SDI standardised: No

Sex: Both

Zone	Observed	Expected	RR	CI - lower 95%	CI - upper 95%	Smoothed RR
Study area band 1	537	624.222755	.86027	.7905	.936197	.857589
Study area band 2	8527	9974.837959	.854851	.836898	.87319	.857165

Sex: Female

Zone	Observed	Expected	RR	CI - lower 95%	CI - upper 95%	Smoothed RR
Study area band 1	268	308.075857	.869916	.771757	.980558	.866608
Study area band 2	4279	4956.85589	.863249	.837767	.889506	.866206

Sex: Male

Zone	Observed	Expected	RR	CI - lower 95%	CI - upper 95%	Smoothed RR
Study area band 1	269	316.146898	.85087	.755029	.958877	.84872
Study area band 2	4248	5017.982069	.846555	.821477	.8724	.8486

SDI standardised: Yes

Sex: Both

Zone	Observed	Expected	RR	CI - lower 95%	CI - upper 95%	Smoothed RR
Study area band 1	537	589.514583	.910919	.837042	.991317	.898297
Study area band 2	8527	9747.262787	.87481	.856437	.893576	.877034

Sex: Female

Zone	Observed	Expected	RR	CI - lower 95%	CI - upper 95%	Smoothed RR
Study area band 1	268	298.257482	.898552	.797163	1.012838	.887528
Study area band 2	4279	4894.05589	.874326	.848517	.90092	.878949

Sex: Male

Zone	Observed	Expected	RR	CI - lower 95%	CI - upper 95%	Smoothed RR
Study area band 1	269	291.2571	.923583	.819551	1.040819	.906056
Study area band 2	4248	4853.206897	.875298	.849367	.902019	.878609

Marc's 1st impression of EUROHEIS RIF

- Pros
  - point 'n' click, easy to use
  - many more maps for area of concern
  - zones/buffer analysis extended to include multiple sources, multiple buffer bands, input external file
  - system seemed "quick" in execution
  - lesser level of programming to maintain
- Cons
  - ArcView 3.2/Avenue versus ArcGIS/Visual Basic
    - portability, platform independence

CCO implementation of RIF

- Political feasibility
  - scale in implementation, ex local system for single organization
  - organization "on board"
  - proposed usage within organization
  - support of data providers
    - maintenance and supply of health, denominator, socio-economic, environmental and geographical data

CCO implementation of RIF

- Political feasibility (cont'd)
  - ensure appropriate use of data
  - small area analysis and suitability of low level aggregation
    - confidentiality of individuals
  - assess restrictions on the distribution and publication of results from the system

CCO implementation of RIF

- Technical considerations
  - Hardware: processor, hard disk space, memory, backup, storage media
  - Software: DB communicate seamlessly with GIS
  - Staff: network of skilled experts
- Economic feasibility
- Methodological feasibility
  - feasibility of geocoding, GIS related linkages