Data analysis protocol for SHELS phase 4

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Version	Date	Author/Editor	Comments
1.0	20 October 2014	Genevieve Cezard	Version 1.0 signed off by Data Analysis
			Group
2.0 draft	20 March 2015	Linda Williams	Updates to all cause hospitalisations and
			bowel cancer screening.
2.0 draft		GC and AD	Updates to section 3.3, 4.3 (SIMD as
			categorical), stage 2c (add preventable
			mortality), BBV analyses stage 5b, Bowel
			cancer screening analyses. Addition of tables
			for ICD10 codes for amenable mortality and
			avoidable hospitalisation and update to
			Infections codes table.
2.0 draft	05 May 2015	LW	Modifications to all cause hospitalisation incl.
			readmissions, LOS and avoidable
			hospitalisations)
2.0 draft	01 Jul 2015	AD	Minor changes to all cause hospitalisation
			and bowel cancer screening
2.0	03 Sep 2015	Anne Douglas	Version 2.0 signed off by data analysis
			subgroup and chairs of hospitalisations and
			bowel cancer screening subgroups.
3.0 draft	21 January 2016	GC	Removal of "pair-wise comparisons", keeping
			"comparison to the White Scottish"
			reference to ensure accurate statistical
			terminology.
			Updates to bowel cancer screening analysis
	Feb-May2016	LW,AD,GC	p50-52
			Updates to SHELS analysis and Variables
			sections 4.2 and 4.3
			Addition of appendix 5
			Update to Injuries analysis p33
			Add specific conditions for LOS analysis p19
			Specified "chronic" for attendance at
			specialist services for Hepatitis C p47

1. Preparatory work (3-6 months)

1.1 Data analysis plans

Subgroups will be convened for each health area. Subgroups will discuss and identify key and appropriate questions and hypotheses relevant to specific health areas and develop specific analysis plans detailing analysis objectives, questions and hypotheses, diagnoses and diagnostic codes (ICD), inclusion and exclusion criteria and methods. These analyses should be appropriate to the health area, take into account timelines and available resources as well as data limitations and ethical and methodological issues relating to the linked dataset. Analysis plans should prioritise key analyses using this agreed approach: 1. Prioritise hypothesis-based analyses and allow time for detailed exploration. 2. Look at other exploratory disease areas in a more simple analysis.

1.2 List of health and census variables for extraction

Final analysis plans should generate a list of required health and census variables. This list should be checked against health and census fields available. A list of agreed census variables used in phase 3 is detailed in the PID, and any additions to this list will need to be justified and discussed with NRS. Except for Blood borne viruses (BBV) data extracts which will be prepared at HPS, fields needed from the health extract should be communicated to the data extraction team at ISD taking into account the need for any additional secondary 'generated' fields (i.e., age at specific time, time to event for survival analyses).

2. Data extraction (1-2 months)

Location: ISD (eDRIS), NRS

Staff: Markus Steiner, Genevieve Cezard, Anne Douglas, HPS team liaising with eDRIS **Time estimation:** Health extracts are expected 1-2 month after approval received, around Spring 2014 the earliest.

2.1 Health data extract

The eDRIS data extraction team will provide an extract of data as agreed using the agreed list of variables and also with detailed documentation of the data extract. This should contain information on the file size, number of records/observations, time period of observations, a list of variables including codebook and any other relevant information about the datasets. The data extract should contain all the identified fields, for all the cases (as identified by ICD codes from 2001 to the nearest complete date), for the required time period. We are asking for 10 years of hospitalisation records prior to the 2001 census for specific health outcome (infectious diseases). The extract will have all identifiable information and CHI removed but an encrypted CHI added instead. Once the data has been extracted, it will put on the SHELS shared folder at ISD and a meeting should be arranged between the data analyst and extraction team to double check the extract against the variable list and check for any missing

For phase 4, we would like the extract of all hospitalisation, all mortality, and both health areas infectious diseases and "injuries, accidents and poisoning" to be provided at the same time as format of the data needed is similar (SMR01 and death records). For all hospitalisation and the specific health areas data, in addition to relevant SMR01 data, related death records will be extracted. For the specific health area data, specific death records of the health area will also be extracted for people without a CHI or a SMR01 record. Bowel cancer screening data and Cancer registry data (SMR06) will be linked and provided separately. Health Protection Scotland (HPS) datasets will be provided after optimal linkage to the CHI and subsequent linkage to specific hospitalisation and death records.

2.2 Census data extract

information.

NRS will provide an extract of agreed census data accessible in the safe setting at NRS only. This will be the same data used in phase 3 with the addition of the Standard Occupational Classification (SOC) and with a unique reference number for each new ISD extract. The reference number will be the same for the all hospitalisation and the all mortality data extracts which will be linked to the primary care sample dataset created during phase 3 available in the NRS safe setting and henceforth only one associated census extract will be required for the all hospitalisation and all mortality extracts. All census records should be provided with an indicator to identify those with a census link and those without. This will allow for subsequent exploration of linkage rates and assessment of bias. This extract should be checked for completeness prior to linkage with health data.

2.3 SHELS data extract

From phase 3, we will reuse 2 datasets which are held at NRS. The primary care sample dataset will be used for further linkage and analysis in order to enable the analysis of risk factors. To adjust the calculation of the census denominator (person year at risk) for the lost

to follow-up, the death and migration file will be updated at ISD with the most recent data and continue to be routinely linked to the census file at NRS prior to linkage to the corresponding health dataset.

3. Data preparation (5-6 months)

Location: ISD, HPS, NRS

Staff: Markus Steiner, Genevieve Cezard, Anne Douglas, HPS team

Time estimation: Data preparation should be done from May to October 2014 assuming data extracts are ready.

3.1 Data preparation at ISD - health data (3-4 months)

Preparation of 5 morbidity and mortality datasets will be carried out at ISD by the data analysis team (Markus Steiner and Genevieve Cezard, Anne Douglas for supervision and validation).

Before preparation of the dataset for data analysis the following steps are necessary:

a- Cross-check and overview of each datasets contents validation according to the requested information and provided codebook:

- Tabulation and documentation of the content of the dataset provided by the ISD data extraction team and interaction with the ISD team if issues arise.

- Check for outliers, inconsistent data or missing values

b- Corrections (arising from step a.):

- Apply appropriate corrections if needed

- Report in writing all the steps of the checking, decisions and corrections done by commenting on the code (SAS program)

c- Prepare datasets for the analysis:

- SAS programming to define the health outcomes of interest (e.g. 1st events of specific diagnostic conditions within a specified time period (based on a known consistent period of data collection)) and creation of outcome variables as defined in the corresponding health area specific analysis plan.

- Clarifying the criteria for diagnostic exclusion (only specific diagnostic condition and/or exclusion of a whole diagnostic group) for the look back procedure. This will require input and clarification from sub-group chairs.

- Preparation and documentation of the datasets for outcomes of interest (e.g. 1st event or any event), this includes complete variable and value labelling in SAS.

d- Validation of the created datasets

- Tabulation of the diagnostic events for each condition by year for the specified time period and double-check against publications (ISD, reference papers) and with subgroup chairs to determine if the numbers we get are sensible and expected.

- Validation of the created datasets done by a 2nd person (Anne) using the commented upon code (in order to make sure that nothing has been missed)

e- Preparation of the health dataset(s) to be sent to NRS:

f- The created and validated health datasets are (newly) documented including file size, observation numbers, and variable list together with a codebook and MD5 hashes of the datasets and compressed/encrypted (WinZIP using AES encryption) for transfer to transfer medium. NHS secure FTP will be used if available at NRS.

g- Specification of the linkage output to be produced by NRS (to be done by analysts and emailed to NRS detailing what census records are required. As 1.3.2 above, we will need all census records)

3.2 Data preparation at HPS - health data (2-3 months)

a-f- similar to 3.1

g- The prepared BBV data at HPS by a HPS analyst (Christian Schnier) are transferred to ISD (using SFTP) for CHI encryption before transfer from ISD to NRS.

3.3 Data checking at NRS - census and linked health data (1.5-2 months)

The team at NRS (currently David Campbell) will check the health and death data (extracted at ISD) received with the help of the attached file documentation. If any issue is noticed, the data analyst(s) concerned will be contacted before proceeding. Otherwise the health-census identifier will be linked to the health (or death) data.

NRS staff should make the full health dataset (without modifications in observation numbers or health outcome) linked with death and census information and the full census dataset linked with death and migration data* available in the safe setting at NRS. An identifier will be created for the purpose of linking the census/death dataset to the health dataset. An arbitrary flag variable will also be added in all datasets for linkage rate analysis (to allow the evaluation of the non-linkable proportion of events in the health or death data).

* NB. NRS does not collect data on deaths for Scottish residents who die outwith Scotland (ie England, Wales and abroad). Therefore these are not included in our deaths records obtained from ISD. NHSCR does include information it might receive on an ad-hoc basis about deaths abroad, and also 'cleans' the data at regular intervals and this will feed into ISD deaths data at that point.

Validation of the morbidity/mortality data, Bowel Cancer Screening/Cancer registry and BBV data linked to the census 2001 data will be carried out at NRS by data analysts (Markus Steiner, Genevieve Cezard, Anne Douglas for supervision).

a- Checking of the linked dataset contents:

- Look at numerators and denominators and check if they are as expected

- Check (frequency tables) all variables of the dataset

- Cross tabulate ethnicity with the outcome variable and breakdown by all the variables of interest to check distributions and the extent of missing values- Apply corrections if needed and comment on the code accordingly

- Main and all diagnosis as well as primary and all causes of deaths will be tabulated by ethnicity to allow decision within each subgroup when necessary

b- Prepare for disclosive issues:

- Define the different ethnic groups that are possible and relevant for the analyses

- Check for disclosive information for each ethnic breakdown selected, with the health outcomes of interest and the possible covariates

- Decide how ethnic groups will be categorised, with subgroup chairs, taking into account small numbers and which minority ethnic groups are of interest for each specific health outcome.

c- Report the linkage rates

- Calculate the relevant linkage rates (% of health/ISD records from 2001 onward linked to census information)

4. Statistical analysis (24 months)

4.1 Development of statistical methods and procedures

Location: ISD & PHS/UoE/NRS Staff: Markus, Duncan, Genevieve, Anne Time estimation: end 2013 – mid 2015

Development of a statistical routine for calculating relative risks/risk ratios, for model checking and appropriate documentation:

- 1 Based on simulation datasets from phase 2 and 3 the methods around calculating risk ratios using Poisson regression were validated regarding the appropriate use of standard or robust variances
 - <u>Result</u>: Use of **robust regression methods only** for all models; parameter estimates for ethnic groups and all covariates are included in the outputs.
- 2 The use of Negative binomial regression will be tested of each outcome to fit with the underlying over dispersed or under dispersed distribution of the data.
- 3 Review of diagnostic measures for both Poisson and Negative binomial regressions and necessary outputs.
- 4 Implementation of diagnostic measures is tested and a protocol for their appropriate use is developed. A decision had been made of what diagnostic measures are needed in the disclosure documents for the chairs to make a decision on which models are used (if not decided during the analysis stage within NRS by the data analysts)
 - <u>Result</u>: The following diagnostic parameters are included in the outputs
 - Residuals * Predicted plot
 - Use of %vuong macro to compare nested models (<u>http://support.sas.com/kb/42/514.html</u>)
 - $\circ~$ GoF statistics copied over from the conventional model as it isn't in the output of the robust model output
 - Deviance/df should be close to 1
 - Output tables should contain:
 - estimate / se / df / Wald / p + RR + n
- 5 The SAS macro code for risk ratio calculation will be cleaned and modified to include necessary diagnostic output, and generalized to be usable without modification for any health area. This should ensure a standard quality for all outputs using the specified method.
- 6 The possibility to use repeated events instead of 1st events only will be evaluated and reviewed. If this proves valuable by the PI and chairs and if time is available, appropriate SAS code will be developed including a standard procedure for output.
- 7 The developed SAS code, as described above, is sent to NRS via email to be transferred onto the PCs in the safe setting by NRS staff.
- 8 All SAS programs should be documented in a separate table documenting: subject area (all hospitalisation, all mortality, accident and poisoning, infection, bowel cancer screening), file name, path, date of last modification, source file (if based on a previous version of a file) and comment (documentation of relevant changes; exemption is work in progress that has not been utilised to produce relevant output).

4.2 Statistical analysis of linked data

Location: NRS Staff: Markus Steiner, Genevieve Cezard, Christian Schnier for assistance on HPS data, Anne Douglas for supervision Time estimation: early 2014 – end 2015

Analyses (to adapt depending on each analysis plan):

- 1 Creating distribution tables (frequencies and percentages) for the health outcome of interest by ethnicity, age categories, sex, and any other relevant covariates as specified for each analysis.
- 2 Ethnic group categorisation will be discussed and agreed by the chairs and the PI before further analysis.
- 3 Calculating age adjusted rates for the outcome of interest by ethnic group and sex, with White Scottish as a reference using a person-year approach.
- 4 Calculating relative risks for events of interest. Poisson regression with robust error variances or Negative Binomial regression will be used depending on the underlying distribution of the data. Whenever possible, we will check the best model using goodness of fit measures. The outputs will contain parameter estimates for all covariates used in the model, and diagnostic measures as appropriate and developed in *3.1* (e.g. diagnostic plots). Latter might need clarification if diagnostic plots contain identifiable information.
- 5 Adjust for further risk factors as agree for each specific subgroup analysis.
- 6 Output tables from the regression models will be checked for disclosive figures and nominator/denominator figures checked against previously verified numbers from 3.2.1
- 7 Meetings with members of the subgroups in the safe setting in NRS will be necessary to decide on the final models prepared in 3.2.4.

4.3 Analysis of SHELS variables and expected results

1) Ethnicity (main variable)

- i) <u>Self-reported ethnicity</u>: is the main way we assess ethnicity. Other variables that relate to ethnicity e.g. country of birth or religion may be used to gain further insight into ethnic variations, or occasionally, used for stratified analysis.
- ii) <u>Anticipated results</u>: experience shows that for most outcomes there are sizeable and potentially important ethnic variations when each minority group is compared against the Scottish White reference population.
- iii) <u>Interpretation</u>: We will not have the required risk factor data for causal analysis but we will examine the effects of some co-variables as considered below (No 3 onwards).

Variables that are not directly related to ethnicity will be utilised as below.

- 2) Sex
 - i) We analyse data by sex. We do this in the tradition of reporting vital statistics. In addition, we do this because there are often varying patterns of disease in males and females. While this implies that sex is an effect modifier, in SHELS our focus is on ethnic rather than sex variations. Formal analysis to compare patterns in males and females is not planned in SHELS4.
 - ii) <u>Anticipated results</u>: We expect some differences between men and women but we will simply signal these as of potential interest in future phases of SHELS.
 - iii) Interpretation: We will not attempt to interpret or explain sex variations.

3) Age

- i) Age greatly affects disease patterns in all populations. However, age is not of primary interest in SHELS, especially as numbers of outcomes decline rapidly when specific age groups are studied. However, we check age specific data in the safe haven. We do this as a data quality check and as a way of seeing whether there may be ethnic variations in the relationship between age group and disease outcome.
- ii) <u>Anticipated results</u>: Mostly, we expect age specific results to be similar across ethnic groups. When this is so we will adjust for age in Poisson regression models. Where there are potentially important differences in age patterns between ethnic groups the subgroup needs to discuss these. The analysts need to draw this to the attention of subgroup chairs and the PI.
- iii) <u>Interpretation:</u> Mostly, ethnic minority groups are younger than the reference. After age adjustment we assume age differences have been fully accounted for. This age adjusted analysis is our primary analysis answering the question: Are there ethnic variations in comparisons of each ethnic minority group with the White Scottish population?

4) Country of birth (CoB)

i) It is known that, mostly, there is a convergence of disease risk whereby immigrants' risk becomes closer to that of the host (here reference) population. We do not have data on time since settlement. Country of birth is used in SHELS as an alternative. We would expect there to be differences in disease patterns in ethnic minority people born in the UK and those born abroad. Ideally, we would analyse these subgroups separately (as for sex) but the numbers of outcomes by ethnic group often becomes too small for meaningful analysis. So we will enter CoB into our model, when this is appropriate. CoB can also sometimes be used as a stratifying variable for example as used in the BBV analysis in SHELS 4. <u>Anticipated results</u>: On the assumption of convergence, where the foreign born have a higher rate of disease than the UK born, we would expect the difference in the RR to decline after such adjustment. Where the foreign born have a lower rate the difference in the RR would rise.

ii) <u>Interpretation</u>: We can interpret the adjusted data as indicating what the ethnic group patterns would be like if each ethnic group had the same country of birth pattern as the reference population i.e. White Scottish.

5) Socio-economic variables

- i) One major explanation for observed ethnic variation is difference in socioeconomic status which is associated with both disease outcome and ethnicity. We will enter into our Poisson models one or more socio-economic variables based on our published SHELS 3 methodology as adapted by SHELS 4 data analysis subgroup.
- ii) <u>Anticipated results</u>: Experience shows that in SHELS adjustment for these variables often makes little difference. Nonetheless, using our methodology, we would expect that where the ethnic minority group has higher (better) socio-economic status (SES) than the reference population, ethnic differences in RRs will become greater. Where the minority group has lower SES ethnic differences will become smaller.
- iii) <u>Interpretation</u>: given our SES indicators are limited and may not be truly indicative of SES we should be cautious. However, mostly we will interpret findings as indicating the potential importance of SES in the pathways leading to ethnic differences in disease outcome.
- iv) Are SES indicators confounding factors?

A confounding factor ought <u>not</u> to be on the causal pathways. In the field of ethnicity, race and health it is agreed that SES is likely to be on the causal pathway e.g. through racial discrimination leading to relative poverty and psychosocial stress, subsequently leading to disease. SHELS subgroups should be sure that for their outcomes SES is not on the causal pathway before labelling SES indicators as confounding factors. This requires work on causal pathways (including directed acyclic graphs).

 v) <u>The method to assess various socio-economic measures as potential confounders</u> <u>in the health and ethnicity association</u> has been published: Fischbacher CM, Cezard G, Bhopal RS, Pearce J, Bansal N. Measures of socioeconomic position are not consistently associated with ethnic differences in cardiovascular disease in Scotland: methods from the Scottish Health and Ethnicity Linkage Study (SHELS). Int J Epidemiol 2014 Feb;43(1):129-39.

In SHELS4, we intend to use a comparatively simpler analysis in 2 steps. First, we will analyse the strengh of association between each socio-economic measures of interest and the health outcome under study by ethnic group. We will select for inclusion in the regression analysis the measures which are similarly associated with the outcome across ethnic groups as potentially valid confounders.

In phase 4 and for the census participants of any age, we will use:

- Scottish Index for Multiple Deprivation (SIMD) (100% complete and use as a categorical variable, either quintiles or deciles etc))¹
- Household tenure (98.5% complete)
- Education at the household level (95% complete)

We will also investigate the use of a combined individual and household level education where the individual level of education is used for people aged 16-74 and the household level for children and elderly.

Where analysis of adults and particularly 16-74 year olds is appropriate we will use:

- Education at the individual level (100% complete in this age group)
- Economic activity last week (100% complete in this age group)

When there is a wide number of outcomes under study for a specific health area, the analysis to choose socio-economic variables for inclusion will be restricted to groups of diseases rather than each one of the whole set.

6) Other variables: acknowledge causal factors

- i) From the primary care data set we have some variables that are agreed as causal e.g. smoking and diabetes for our outcomes of CVD and all-cause mortality.
- ii) <u>Anticipated results</u>: we expect that when entered into the model these covariables will alter the RR. The direction of change is predictable e.g. if the minority group has a higher prevalence of the RF the differences in RRs compared to the reference will decrease. When the prevalence is lower the difference in RR will increase.
- iii) <u>Interpretation</u>: We will interpret changes as indicative of causal effects of the variables. Our measures are imperfect so these causal effects are likely to be underestimates as occurs with misclassification (and regression dilution) errors.

The nature of variables

It is not always clear how a variable such as CoB or SIMD or education is fitting into a causal pathway. Such variables could be thought of as confounders, effect modifiers or causal risk factors. This requires detailed consideration and this process can be done through causal graphs. Causal graphs have now been prepared and are being considered.

¹ DAP V1.0 24032015 did not state that SIMD should be used as a categorical variable – SIMD was used as a continuous variable in adjusted models for all cause mortality and BBV. Checks on all cause mortality results showed no difference in RRs and CIs when SIMD used as categorical variable

5. Disclosure review and release (2 weeks)

5.1 Preparing outputs for disclosure review and release

Outputs should be prepared for release guided by the data analysis plan and subgroup discussions and follow an agreed table template (see Appendix one). Outputs for release are categorised as intermediary and final outputs, Intermediary outputs are only for distribution within the research groups to inform a decision process and not for distribution or use in publications. Intermediary outputs provide important background information and should take into account future final table requests particularly in relation to changes in group categorisations. Where possible, detailed intermediary outputs should be viewed in the safe setting with subgroup chairs.

Outputs should be double checked for errors prior to submission and cells checked against NRS disclosure guidelines (appendix two).

All frequency numbers below 5 included will be removed and those above 6 included will be rounded to the nearest 5. Percentages should be derived from rounded numbers.

All outputs should be accompanied with a detailed contents list providing the following information:

- Linked file: i.e. all hospitalisation
- Date of analysis (manually including to avoid automatic update)
- Number of tables/figures requested
- Number of request (i.e., phase 3/ all hospitalisation/output 1/version 1)
- Intended use of output (i.e., internal use, presentation, publication)

Each table/figure in the output should be clearly and appropriately labelled and numbered. When submitting revised or amended outputs, replacing or relating to previously released outputs, this should be clearly stated with changes made i.e., this output is a revision of table 3 in previously released output 1, ethnic categories have changed.

One table will be updated and provided with every output for disclosure containing the following information:

- Path, filename and title of the document
- Date of preparation for disclosure
- Date reviewed in NRS
- Result of review
- Filename and Title/Version of document superseded. This is only important for documents which are replaced by a newer version for whatever reason (data error, etc). It is in the responsibility of every project member to securely destroy superseded documents (see Appendix three).

When outputs are ready for submission they should be placed in an appropriately labelled and dated folder which should be placed in the 'Outputs for review' folder on the D drive. A copy of the output should also be placed in the health area folder for that analysis and added onto the 'list of outputs submitted for review' so that we have an updated record of all outputs submitted.

An email is then sent to the project IT support team at NRS (currently Robert Collins) informing them and the disclosure team of outputs submitted. Where possible the IT team and NRS disclosure committee should be informed in advance of number and timing of outputs for removal and review, respectively.

5.2 Transfer of outputs from safe setting PC to NRS committee

The NRS IT team should confirm transfer of outputs to the disclosure team by sending data analysts a confirmatory email.

5.3 Release of documents from NRS disclosure committee to data analysts

NRS disclosure committee should advise data analysts of timing of review and release on receipt of outputs. Any queries should be raised with the lead data analyst including the whole data analysis team in all emails. On release, the committee should make clear any changes made or failed outputs. Outputs should be emailed to all project data analysts.

5.4 Sharing and use of released outputs

Outputs should be shared with the subgroup chair and subgroup members as relevant. Any further sharing should be limited to the steering group and on a need to know basis. Sharing of outputs outwith the steering and subgroup is prohibited and would require approval by the project steering group and NRS disclosure committee. Outputs should only be used for the intended use as detailed on submission. Further use needs to come back through disclosure committee for review and approval. A secure option to store and access documents online rather than using printouts will be re-evaluated to prevent the use of outdated output documents and minimise the need for printouts.

5.5 Storage and destruction of released outputs

All printed outputs should be marked and dated. File and paper outputs should be treated as confidential and stored securely. Paper copies of printouts should be kept to a minimum. File and paper outputs should be destroyed and disposed of securely when superseded or replaced by subsequent updated outputs (Appendix three).

5.6 Publication and presentation to conferences

All outputs used in publication and presentation need to be cleared by the disclosure committee. All materials about to be shared externally to SHELS members should be sent to currently David Campbell (and members of the NRS disclosure team): abstracts and manuscripts before submission and slides before presentation. Publications and presentation can be sent to CSO for information.

Area: all hospitalisation, all mortality, infections, injuries, accident and poisoning

(SMR01 & death registrations)

Objectives

To explore:

- a) Ethnic inequalities in all-cause hospitalisation, readmission and length of stay
- b) Ethnic inequalities in all-cause mortality
- c) Ethnic inequalities in hospitalisation and/or mortality in the following conditions:
 - Injuries, accidents and poisoning
 - Infections

Analysis will be done by ethnicity (the reference group being White Scottish), by sex and examining the potential effect of available covariates (see next page)

<u>Additional</u>

d) Explore ethnic inequalities in unmet need for health care by looking at differences in avoidable hospitalisation, unplanned readmission and amenable mortality

Outcomes

For the study period (1/5/2001 - 30/4/2013):

- a) 1st hospital discharge/hospital death for any disease
- b) Subsequent hospital discharge
- c) Length of stay for any hospital admission
- d) Death for any cause
- e) 1st hospital discharge/ any death for specific diseases (accidents, injuries and poisoning and infections)

Note

Results for "all other ethnic groups" will be available at NRS but not included in publications because of difficulties of interpretation in such a mixed group.

Main covariates (sex stratified)

• Age

Socioeconomic variables which will be added in the regression analysis if assessed as having a consistent and positive association with the outcome across ethnic group: For population of any age:

- Area based socioeconomic status: Scottish Index of Multiple Deprivation (SIMD)
- House ownership
- Highest qualification (household)

We will also investigate the use of a combined individual and household level education where the individual level of education is used for people aged 16-74 and the household level for children and elderly.

For adult population (restricted to 16-74 years old):

- Highest qualification (individual)
- Economic activity in the previous week of census completion

Other covariates:

- Country of birth (UK/Non-UK)
- Religion
- Marital status
- Urban/rural indicator
- Health board
- Occupational risk group

For injuries, accidents and poisoning and infections specifically:

Diagnosis criteria:

All six diagnostic positions in the SMR01 dataset or all 11 positions in the death records will be included to identify specific diseases.

Diagnostic groups (ICD 10):

- For accidents and poisoning Table 1
- For infections Table 2

Deaths:

The numbers of deaths outside hospital is usually small. Assuming that such deaths count for less than 20% of incident cases, hospitalisations, including deaths in hospital, and deaths outside hospital will be combined for analysis.

Minimum number of cases:

A specific disease will be analysed by ethnic group if the total number of incident events for this disease reached 1000 cases per year. This should allow enough numbers for minority ethnic groups to be studied as well as provide sufficient statistical power for the analysis.

Project analysis plan – Stage 1a: All-cause hospitalisation (1) Incidence of any hospital admission, by ethnicity and sex

Background	Little is known about differences in all-cause hospitalisation rates by
	ethnic group in Scotland or in the rest of the UK.
Aim	Establish the pattern of ethnic differences in the incidence of all-cause
	hospitalisation in Scotland
	1. There are ethnic variations (≥10%) in rates of all-cause hospitalisation
Hypotheses	in men and women. We hypothesise these will vary in pair-wise
	comparisons between specific ethnic groups and White Scottish.
	2. These variations cannot be fully explained by available covariates
Data and ICD	Linkage census database, SMR01.
codes	
Numerator	Admission between May 2001 – April 2013
	The total number of hospitalisations over the period of interest
Denominator	Linked 2001 census population – no age restriction
	Person Years adjusted for deaths and leaving NHS Scotland
Tabulation	For both sexes and each ethnic group
Analysis	For both sexes and each ethnic group
	Incidence (number of first events), report absolute numbers
	Inspect age stratified results (10 years age band, children, adult) – not for
	disclosure
	Report differences in age-adjusted hospitalisation rates and age-adjusted
	risk ratios (Poisson) with confidence intervals and p-values
	Adjust for other relevant covariates
Adjust/stratify	Explore the effect of a range of available covariates

Project analysis plan – stage 1b: Readmission

(1) Readmission following first hospital discharge, by ethnicity and sex

Background	Little is known about differences in readmission rates by ethnic group in
	Scotland or the rest of the UK.
Aim	Explore ethnic variations in readmission rates
Hypotheses	1. There are ethnic variations (≥10%) in readmission rates in men and
	and White Scottish.
	2. These variations cannot be fully explained by available covariates
Data and ICD	Linkage census database, SMR01.
codes	1- All-cause hospitalisation, all ICD codes
Numerator	Admission to hospital within 30 days (<30 days) of previous hospital
	b) Total number of readmissions due to any urgent or emergency code
	(or non-elective)
Denominator	Linked 2001 census population, with first hospital admission between
	May 2001 – April 2013
	(Total number of admissions (excluding hospitalisations of patients who
	died within 30 days of discharge – including death in hospital - and
	hospitalisations with insufficient post-discharge time to close of study)
Tabulation	By 10 year age band, sex, ethnic group and 3-4 years period (for frend analysis)
Analysis	
	Inspect 30 days urgent/emergency/non-elective readmission by sex and ethnic group, adjusted for age
	Report differences in age-adjusted discharge rates and age-adjusted risk
	ratios (based on Poisson regression) with confidence intervals and p-
	values
	Adjust for other relevant covariates
	Examine in-hospital mortality rates
	Trend analysis: same analysis for each 3-4 years period with look-back
Adjust/stratify	Explore the effect of a range of available covariates
Future	Adjustment for comorbidity and initiating disease. Adjust for LOS.
research	

Project analysis plan - stage 1c: Length of stay (LOS)

Background	Little is known about differences in LOS by ethnic group in Scotland or in
A !	the rest of the UK.
AIM	Explore ethnic variations in length of stay
Hypotheses	There are ethnic variations (≥10%) in length of stay in men and women. We hypothesise LOS will be longer in minority ethnic groups compared to White Scottish. These variations cannot be fully explained by adjustment for available covariates
Data and ICD	Linkage census database, SMR01.
codes	All-cause hospitalisation (excluding individuals with no hospital stay) LOS of 0 (day cases) will be adjusted to 0.5 days
Numerator	Length of stay of any hospitalisation
Denominator	Linked 2001 census population, with hospital admission between May
	2001 – April 2013
	No denominator, but may need to assume independence of visit lengths
	if it is not possible to include repeated measures on a patient basis.
Tabulation	By sex and ethnic group
Analysis	Between May 2001 – April 2013:
	LOS for all hospitalisations and 3 selected specific conditions (with high number of hospitalisations)
	Adjust for age, and other relevant covariates. Examine the distribution 'tail' (>90 days) and examine distribution of diagnosis codes/chapters. Perform sensitivity analysis of LOS including/excluding excessively long stays. Check fit of data to Poisson, log and Negative Binomial distributions. LOS will be compared over periods of years to allow a trend analysis if numbers and time allow.
Adjust/stratify	Explore the effect of a range of available covariates. Possible further stratified/adjusted analyses (eg by diagnostic group or indicator condition) will be considered in due course.
Future	Inclusion of DRG/HRG codes (or ICD10 chapters). Calculate expected LOS
research	from case mix in order to calculate excess LOS, would need Charlson Index and/or secondary hospitalisation causes.

Project analysis plan – stage 1d: Avoidable hospitalisation

(1) Avoidable hospitalisation, by ethnicity and sex

Background	Nothing is known about differences in avoidable hospitalisation by ethnic group in Scotland and little in the rest of the UK. Most of the work in this area has been done in the US
Aim	Calculate incidence rate by ethnic group
Hypotheses	There may be ethnic variations in the proportion of hospitalisations that can be considered avoidable. We hypothesise there will be variations between specific ethnic groups and White Scottish. These variations cannot be fully explained by adjustment for available covariates
Data and ICD codes	Linkage census database, hospital discharge ICD codes as per the Department of Health's Outcomes Framework
Numerator	 Hospital admissions (for those aged 19 years and over) identified as avoidable (using NHS outcome framework definition) between May 2001 April 2013 (or latest reliable date) all avoidable hospitalisations acute chronic Total number of events (all, chronic, acute)
Denominator	Linked 2001 census population aged 19 years and above Person Years adjusted for deaths and leaving NHS Scotland
Tabulation	By sex and ethnic group
Analysis	For both sexes and each ethnic group
	Number of avoidable hospitalisations (all, acute, chronic) Inspect stratified results by age- not for disclosure Report differences in age-adjusted avoidable hospitalisations rates and age-adjusted risk ratios (using Poisson regression) with confidence intervals and p-values Further explore the adjustment for socio-economic covariates if time and resources allow.
Adjust/stratify	Explore the effect of a range of covariates

ICD10 codes	Condition	Acute	Chronic
A02.0	Salmonella enteritis	Х	
A04	Other bacterial intestinal infections	Х	
A05.9	Bacterial foodborne intoxication, unspecified	Х	
A07.2	Cryptosporidiosis	Х	
A08	Viral and other specified intenstinal infections	Х	
A09	Diarrhoea and gastroenteritis of presumed infectious origin	Х	
A36	Diphtheria	Х	
A37	Whooping cough	Х	
A69.0	Necrotizing ulcerative stomatitis	Х	
B05	Measles	Х	
B06	Rubella	Х	
B16.1	Acute hepatitis B with delta-agent without hepatic coma	Х	
	Acute hepatitis B without delta-agent and without hepatic		
B16.9	coma	х	
B18.0	Chronic viral hepatitis B with delta-agent		Х
B18.1	Chronic viral hepatitis B without delta-agent		Х
B26	Mumps	Х	
D50.1	Sideropenic dysphagia		Х
D50.8	Other iron deficiency anemias		Х
D50.9	Iron deficiency anemia, unspecified		Х
D51	Vitamin B12 deficiency anaemia		Х
D52	Folate deficiency anaemia		Х
E10	Type 1 diabetes mellitus		Х
E11	Type 2 diabetes mellitus		Х
E12	Malnutrition-related diabetes mellitus		Х
E13	Other specified diabetes mellitus		Х
E14	Unspecified diabetes mellitus		Х
E86	Volume depletion	Х	
F00	Dementia in alzheimers		Х
F01	Vascular dementia		Х
F02	Dementia in other diseases		Х
F03	Unspecified dementia		Х
G25.3	Myoclonus	Х	
G40	Epilepsy and recurrent seizures		Х
G41	Status epilepticus		Х
H66	Suppurative and unspecified otitis media	Х	
H67	Otitis media in diseases classified elsewhere	Х	
110X	Essential (primary) hypertension		Х
111.0	Hypertensive heart disease with heart failure		Х
111.9	Hypertensive heart disease without heart failure		Х
	Hypertensive heart and renal disease with (congestive) heart		
113.0	failure		х
120	Angina pectoris		Х
124.0	Coronary thrombosis not resulting in myocardial infarction	Х	
124.8	Other forms of acute ischaemic heart disease	Х	
124.9	Acute ischaemic heart disease, unspecified	Х	
125	Chronic ischaemic heart disease		Х

 Table 1: Hospitalisation codes considered to be avoidable (NHS Outcomes Framework)

148X	Atrial fibrillation and flutter		Х
150	Heart failure		Х
189.1	Lymphangitis	Х	
J02	Acute pharyngitis	Х	
J03	Acute tonsillitis	Х	
J04.0	Acute laryngitis	Х	
J06	Acute upper respiratory infections multiple and unsp sites	Х	
J10	Influenza due to other identified influenza virus	Х	
J11	Influenza due to unidentified influenza virus	Х	
J13X	Pneumonia due to Streptococcus pneumoniae	Х	
J14	Pneumonia due to Hemophilus influenzae	Х	
J15.3	Pneumonia due to streptococcus, group B	Х	
J15.4	Pneumonia due to other streptococci	Х	
J15.7	Pneumonia due to Mycoplasma pneumoniae	Х	
J15.9	Unspecified bacterial pneumonia	Х	
J16.8	Pneumonia due to other specified infectious organisms	Х	
J18.1	Lobar pneumonia, unspecified organism	Х	
J18.8	Other pneumonia, unspecified organism	Х	
J20	Acute bronchitis		Х
J31.2	Chronic pharyngitis	Х	
J41	Simple and mucopurulent chronic bronchitis		Х
J42X	Unspecified chronic bronchitis		Х
J43	Emphysema		Х
J44	Other chronic obstructive pulmonary disease		Х
J45	Asthma		Х
J46X	Status asthmaticus		Х
J47X	Bronchiectasis		Х
J81X	Pulmonary edema		Х
К02	Dental caries	Х	
К03	Other diseases of hard tissues of teeth	Х	
К04	Diseases of pulp and periapical tissues	Х	
K05	Gingivitis and periodontal diseases	Х	
K06	Other disorders of gingiva and edentulous alveolar ridge	Х	
K08	Other disorders of teeth and supporting structures	Х	
K09.8	Other cysts of oral region, not elsewhere classified	Х	
К09.9	Cyst of oral region, unspecified	Х	
K12	Stomatitis and related lesions	Х	
K13	Other diseases of lip and oral mucosa	Х	
K20	Esophagitis	Х	
K21	Gastro-oesophageal reflux disease	Х	
K25.0	Acute gastric ulcer with hemorrhage	Х	
K25.1	Acute gastric ulcer with perforation	Х	
K25.2	Acute gastric ulcer with both hemorrhage and perforation	Х	
K25.4	Chronic or unspecified gastric ulcer with hemorrhage	Х	
K25.5	Chronic or unspecified gastric ulcer with perforation	Х	
	Chronic or unspecified gastric ulcer with both hemorrhage	Х	
K25.6	and perforation		
K26.0	Acute duodenal ulcer with hemorrhage	Х	
K26.1	Acute duodenal ulcer with perforation	Х	
K26.2	Acute duodenal ulcer with both hemorrhage and perforation	Х	

K26.4	Chronic or unspecified duodenal ulcer with hemorrhage	Х	
K26.5	Chronic or unspecified duodenal ulcer with perforation	Х	
	Chronic or unspecified duodenal ulcer with both	Х	
К26.6	hemorrhage and perforation		
K27.0	Acute peptic ulcer, site unspecified, with hemorrhage	Х	
K27.1	Acute peptic ulcer, site unspecified, with perforation	Х	
	Acute peptic ulcer, site unspecified, with both hemorrhage	Х	
К27.2	and perforation		
	Chronic or unspecified peptic ulcer, site unspecified, with	Х	
К27.4	hemorrhage		
	Chronic or unspecified peptic ulcer, site unspecified, with	Х	
K27.5	perforation		
	Chronic or unspecified peptic ulcer, site unspecified, with	Х	
K27.6	both hemorrhage and perforation		
K28.0	Acute gastrojejunal ulcer with hemorrhage	Х	
K28.1	Acute gastrojejunal ulcer with perforation	Х	
	Acute gastrojejunal ulcer with both hemorrhage and	Х	
К28.2	perforation		
K28.4	Chronic or unspecified gastrojejunal ulcer with hemorrhage	Х	
K28.5	Chronic or unspecified gastrojejunal ulcer with perforation	Х	
	Chronic or unspecified gastrojejunal ulcer with both	Х	
К28.6	hemorrhage and perforation		
K52	Other noninfective gastroenteritis and colitis	Х	
L01	Impetigo	Х	
L02	Cutaneous abscess, furuncle and carbuncle	Х	
L03	Cellulitis	Х	
L04	Acute lymphadenitis	Х	
L08.0	Pyoderma	Х	
	Other specified local infections of skin and subcutaneous	Х	
L08.8	tissue		
L08.9	Local infection of skin and subcutaneous tissue, unspecified	Х	
L88	Pyoderma gangrenosum	Х	
L98.0	Pyogenic granuloma	Х	
M01.4	Rubella arthritis	Х	
N10	Acute tubulo-interstitial nephritis	Х	
N11	Chronic tubulo-interstitial nephritis	Х	
N12	Tubulo-interstitial nephritis not specified as acute or chronic	Х	
N13.6	Pyonephrosis	Х	
N15.9	Renal tubulo-interstitial disease, unspecified	Х	
N30.0	Acute cystitis	Х	
N30.8	Other cystitis	Х	
N30.9	Cystitis, unspecified	Х	
N39.0	Urinary tract infection, site not specified	Х	
015	Eclampsia	Х	
R56	Convulsions, not elsewhere classified	Х	

Project analysis plan – stage 2a: All-cause mortality

(1) Mortality, by ethnicity and sex

Background	There are known all-cause mortality differences by country of birth in
	Scotland. Fischbacher et al showed that, compared to those born in
	Scotland, men born in Ireland had higher all-cause mortality, but lower
	mortality was observed in people born in Northern Ireland (women only),
	Pakistan, Bangladesh (men only), China and Hong Kong (men only).
Aim	Compare and refine the findings for all-cause mortality in Scotland by
	ethnic group with those of Fischbacher et al. where country of birth was
	used as a proxy for ethnicity.
_	1. Large variations (≥10%) in all-cause mortality in males and females are
Hypotheses	expected as previously shown.
	2. These variations will be partly attenuated by adjusting for country of
	birth and socio-economic covariates for White ethnic groups
Data and ICD	Linkage census database, death records
codes	All ICD codes
Numerator	(a) Death (all causes) between May 2001 – April 2013 (or latest reliable
	date)
Denominator	Linked 2001 census population
	Person Years adjusted for deaths and leaving NHS Scotland
Tabulation	By sex and ethnic group
Analysis	For both sexes and each ethnic group
	Number of deaths
	Inspect stratified results for age at death (10 years age band, children,
	younger adults, older adults) – not for disclosure
	A preliminary analysis will report age-adjusted mortality rates and age-
	adjusted risk ratios (Poisson) with confidence intervals and p-values by
	country of birth for comparison purpose with Fischbacher's findings.
	Depart differences in age adjusted martality rates and age adjusted risk
	report unreferees in age-aujusted mortality rates and age-aujusted risk
	Adjust for other relevant variables
	Aujust for other relevant variables
	death if numbers, time and resources allow
	ueath in Humbers, time and resources allow.
	Trend analysis (salmon higs): same analysis for each 3-4 years poriod
	rena analysis (sumon blas), same analysis for each 5 4 years period
Adjust/stratify	Can be refined using country of birth analysis
	Explore the effect of a range of available covariates

Project analysis plan – stage 2b: Life expectancy

(1) Mortality, by ethnicity and sex

Background	Life expectancy by ethnic group has never been calculated in Scotland
Aim	Calculate two estimates of life expectancy by ethnic group, one around the Census 2001 (with SHELS) and the other around the Census 2011 (with ethnicity recorded on the death record).
Hypotheses	There are ethnic variations in life expectancy in Scotland.
Data and ICD	(a) Linkage census database and death records (3 years: 2001-2003)
codes	(b) Census 2011 and death records (3 years: 2012-2014)
Numerator	(a) Deaths in 2001 – 2003
	(b) Deaths in 2012 – 2014
Denominator	(a) Linked 2001 census population
	(b) 2011 census population
Tabulation	By sex and ethnic group
Analysis	For both sexes and each ethnic group
	Life expectancy can be calculated for small area/group under certain conditions of numbers for the area/group:
	- More than 5000 people
	- More than 40 deaths
	It will be calculated by sex or combined depending on numbers.
	Mortality rates will be calculated for 5 or 10 years age bands.
	Life expectancy calculation may only be possible for the larger ethnic
	group and for older age groups.
Adjust/stratify	Explore the effect of a range of available covariates

Project analysis plan – stage 2c: Amenable and preventable mortality (1) Amenable mortality, by ethnicity and sex

Background	Nothing is known about amenable and preventable mortality differences by ethnic group in Scotland or the rest of the UK. Work in this field has been mainly conducted in the US, NZ and Singapore.
Aim	Using pre-established definitions of amenable and preventable mortality, calculate amenable mortality rates by ethnic group.
Hypotheses	There may be ethnic variations in the proportion of deaths that could be considered amenable to healthcare interventions. We hypothesise these will vary between specific ethnic groups and White Scottish. These variations cannot be fully explained by adjustment for available covariates
Data and ICD codes	Linkage census database, death records ICD codes as defined by the Office for National Statistics
Numerator	(a) Deaths identified as amenable (using ONS definition) between May 2001 – April 2013 (or latest reliable date)
Denominator	Linked 2001 census population Person Years adjusted for deaths and leaving NHS Scotland
Tabulation	By sex and ethnic group
Analysis	For both sexes and each ethnic group
	Number of amenable and preventable deaths
	Inspect stratified results by age- not for disclosure
	Report differences in age-adjusted mortality rates and age-adjusted risk ratios (Poisson) with confidence intervals and p-values
	Further explore the adjustment for socio-economic covariates if time and resources allow.
Adjust/stratify	Explore the effect of a range of available covariates

Table 2: Causes of death (classified using the International Classification of Diseases, tenth revision) considered to be avoidable

Based on underlying cause of death

Condition group and cause	ICD-10 codes	Age	Amenable	Preventable
Infections				
Tuberculosis	A15-A19, B90	0-74	•	•
	A38-A41, A46,			
Selected invasive bacterial and	A48.1, B50-B54,	0-74	•	
protozoal infections	G00, G03, J02,			
Hepatitis C	B17.1. B18.2	0-74	•	•
HIV/AIDS	B20-B24	All	•	•
Neoplasms	-			
Malignant neoplasm of lip. oral				
cavity and pharynx	C00-C14	0-74		•
Malignant neoplasm of	C15	0-74		•
oesophagus	010			
Malignant neoplasm of stomach	C16	0-74		•
Malignant neoplasm of colon and rectum	C18-C21	0-74	•	•
Malignant neoplasm of liver	C22	0-74		•
Malignant neoplasm of trachea, bronchus and lung	C33-C34	0-74		•
Malignant melanoma of skin	C43	0-74	•	•
Mesothelioma	C45	0-74		•
Malignant neoplasm of breast	C50	0-74	•	•
Malignant neoplasm of cervix uteri	C53	0-74	•	•
Malignant neoplasm of bladder	C67	0-74	•	
Malignant neoplasm of thyroid gland	C73	0-74	•	
Hodgkin's disease	C81	0-74	•	
Leukaemia	C91, C92.0	0-44	•	
Benign neoplasms	D10-D36	0-74	•	
Nutritional, endocrine and metabolic				
Diabetes mellitus	E10-E14	0-49	•	•
Drug use disorders				
	F10, G31.2,			
Alcohol related diseases, excluding	G62.1, I42.6,			
external causes	K29.2, K70, K73,	0-74		•
	K74.5), K86.0			
Illicit drug use disorders	F11-F16, F18-F19	0-74		•
Neurological disorders	· -			
Epilepsy and status epilepticus	G40-G41	0-74	•	
Cardiovascular diseases				

Rheumatic and other valvular heart disease	101-109	0-74	•	
Hypertensive diseases	110-115	0-74	•	
Ischaemic heart disease	120-125	0-74	•	•
DVT with pulmonary embolism	126, 180.1-180.3, 180.9, 182.9	0-74		•
Cerebrovascular diseases	160-169	0-74	•	
Aortic aneurysm and dissection	171	0-74		•
Respiratory diseases				
Influenza (including swine flu)	J09-J11	0-74	•	•
Pneumonia	J12-J18	0-74	•	
Chronic obstructive pulmonary disorder	J40-J44	0-74		•
Asthma	J45-J46	0-74	•	
Digestive disorders				
Gastric and duodenal ulcer	K25-K28	0-74	•	
Acute abdomen, appendicitis, intestinal obstruction, cholecystitis/lithiasis, pancreatitis, hernia	K35-K38, K40- K46, K80-K83, K85, K86.1-K86.9, K91.5	0-74	•	
Genitourinary disorders				
Nephritis and nephrosis	N00-N07, N17- N19, N25-N27	0-74	•	
Obstructive uropathy and prostatic hyperplasia	N13, N20-N21, N35, N40, N99.1	0-74	•	
Maternal and infant				
Complications of perinatal period	P00-P96, A33	All	٠	
Congenital malformations, deformations and chromosomal anomalies	Q00-Q99	0-74	•	
Unintentional injuries				
Transport Accidents	V01-V99	All		•
Accidental Injury	W00-X59	All		•
Intentional injuries				
Suicide and self inflicted injuries	X60-X84, Y10- Y34	All		٠
Homicide/Assault	X85-Y09, U50.9	All		•
Misadventures to patients during surgical and medical care	Y60-Y69, Y83-Y84	All	•	•

Project analysis plan - stage 3: Injuries, accidents and poisoning

(1) Incidence of Injuries, accidents and poisoning hospitalisation and death, by ethnicity and sex

Background	Nothing is known about accidents and poisoning by ethnic group in
	Scotland. In the Netherland, Stirbu found all ethnic minorities combined
	had an increased mortality of all injuries together, pedestrian accidents,
	drowning and poisoning compared to native Dutch but lower mortality in
	accidents involving cyclists and motorcyclists. Ethnic inequalities were
	higher among children and younger adults.
Aim	Establish the pattern of ethnic differences in the incidence of the above
	conditions in Scotland
	1 There are ethnic variations (>10%) in rates of the above outcomes in
Hypotheses	male and female. We hypothesise these will vary between specific ethnic
riypotneses	groups and White Scottish
	2 Patterns of ethnic variations in children younger and older adults
	differ
	3. These variations cannot be explained by available covariates
Data and ICD	Linkage census database. SMR01 and death records
codes	ICD codes for all discharges (ICD10) : Chapter XIX and XX
	See table 1 for breakdown
Numerators	(a) First and recurrent events : Hospital discharge or death between May
	2001 – April 2013 (or latest reliable date)
	(b) for any of the above ICD codes in any of the 6 discharge diagnostic
	nositions in the SMR01 dataset or main cause of death for the above
	conditions. *
Denominator	conditions. * Linked 2001 census population
Denominator	conditions. * Linked 2001 census population Person Years adjusted for deaths and migrations
Denominator Tabulation	conditions. * Linked 2001 census population Person Years adjusted for deaths and migrations For each diagnosis: By sex and ethnic group
Denominator Tabulation Analysis	conditions. * Linked 2001 census population Person Years adjusted for deaths and migrations For each diagnosis: By sex and ethnic group For each diagnosis or for groups of diagnoses:
Denominator Tabulation Analysis	conditions. * Linked 2001 census population Person Years adjusted for deaths and migrations For each diagnosis: By sex and ethnic group For each diagnosis or for groups of diagnoses:
Denominator Tabulation Analysis	conditions. * Linked 2001 census population Person Years adjusted for deaths and migrations For each diagnosis: By sex and ethnic group For each diagnosis or for groups of diagnoses: Incidence (number of first and recurrent events), report absolute
Denominator Tabulation Analysis	 conditions in the binner dataset of main cause of death for the doore conditions. * Linked 2001 census population Person Years adjusted for deaths and migrations For each diagnosis: By sex and ethnic group For each diagnosis or for groups of diagnoses: Incidence (number of first and recurrent events), report absolute numbers
Denominator Tabulation Analysis	 conditions. * Linked 2001 census population Person Years adjusted for deaths and migrations For each diagnosis: By sex and ethnic group For each diagnosis or for groups of diagnoses: Incidence (number of first and recurrent events), report absolute numbers Inspect age stratified results (children aged 0-14, in 5 years age band;
Denominator Tabulation Analysis	positions in the binner dataset of main cause of death for the dooreconditions. *Linked 2001 census populationPerson Years adjusted for deaths and migrationsFor each diagnosis: By sex and ethnic groupFor each diagnosis or for groups of diagnoses:Incidence (number of first and recurrent events), report absolutenumbersInspect age stratified results (children aged 0-14, in 5 years age band;younger adults aged 15 to 24, adults aged 25 to 64 and older adults aged
Denominator Tabulation Analysis	 conditions in the binner dataset of main cause of death for the doore conditions. * Linked 2001 census population Person Years adjusted for deaths and migrations For each diagnosis: By sex and ethnic group For each diagnosis or for groups of diagnoses: Incidence (number of first and recurrent events), report absolute numbers Inspect age stratified results (children aged 0-14, in 5 years age band; younger adults aged 15 to 24, adults aged 25 to 64 and older adults aged 65 +, in 10 years age band) – not for disclosure
Denominator Tabulation Analysis	 Linked 2001 census population Person Years adjusted for deaths and migrations For each diagnosis: By sex and ethnic group For each diagnosis or for groups of diagnoses: Incidence (number of first and recurrent events), report absolute numbers Inspect age stratified results (children aged 0-14, in 5 years age band; younger adults aged 15 to 24, adults aged 25 to 64 and older adults aged 65 +, in 10 years age band) – not for disclosure Report differences in age-adjusted discharge rates and age-adjusted risk
Denominator Tabulation Analysis	 conditions in the binner dataset of main cause of death for the doore conditions. * Linked 2001 census population Person Years adjusted for deaths and migrations For each diagnosis: By sex and ethnic group For each diagnosis or for groups of diagnoses: Incidence (number of first and recurrent events), report absolute numbers Inspect age stratified results (children aged 0-14, in 5 years age band; younger adults aged 15 to 24, adults aged 25 to 64 and older adults aged 65 +, in 10 years age band) – not for disclosure Report differences in age-adjusted discharge rates and age-adjusted risk ratios (Poisson) with confidence intervals and p-values
Denominator Tabulation Analysis	 conditions. * Linked 2001 census population Person Years adjusted for deaths and migrations For each diagnosis: By sex and ethnic group For each diagnosis or for groups of diagnoses: Incidence (number of first and recurrent events), report absolute numbers Inspect age stratified results (children aged 0-14, in 5 years age band; younger adults aged 15 to 24, adults aged 25 to 64 and older adults aged 65 +, in 10 years age band) – not for disclosure Report differences in age-adjusted discharge rates and age-adjusted risk ratios (Poisson) with confidence intervals and p-values Adjust for other relevant variables
Denominator Tabulation Analysis	 conditions in the binner dataset of main cause of death for the dove conditions. * Linked 2001 census population Person Years adjusted for deaths and migrations For each diagnosis: By sex and ethnic group For each diagnosis or for groups of diagnoses: Incidence (number of first and recurrent events), report absolute numbers Inspect age stratified results (children aged 0-14, in 5 years age band; younger adults aged 15 to 24, adults aged 25 to 64 and older adults aged 65 +, in 10 years age band) – not for disclosure Report differences in age-adjusted discharge rates and age-adjusted risk ratios (Poisson) with confidence intervals and p-values Adjust for other relevant variables Explore differences in children, younger and older adults if numbers allow.
Denominator Tabulation Analysis	 conditions. * Linked 2001 census population Person Years adjusted for deaths and migrations For each diagnosis: By sex and ethnic group For each diagnosis or for groups of diagnoses: Incidence (number of first and recurrent events), report absolute numbers Inspect age stratified results (children aged 0-14, in 5 years age band; younger adults aged 15 to 24, adults aged 25 to 64 and older adults aged 65 +, in 10 years age band) – not for disclosure Report differences in age-adjusted discharge rates and age-adjusted risk ratios (Poisson) with confidence intervals and p-values Adjust for other relevant variables Explore differences in children, younger and older adults if numbers allow. Numbers are expected to be too small among the youngest (0-4) and the
Denominator Tabulation Analysis	 Linked 2001 census population Person Years adjusted for deaths and migrations For each diagnosis: By sex and ethnic group For each diagnosis or for groups of diagnoses: Incidence (number of first and recurrent events), report absolute numbers Inspect age stratified results (children aged 0-14, in 5 years age band; younger adults aged 15 to 24, adults aged 25 to 64 and older adults aged 65 +, in 10 years age band) – not for disclosure Report differences in age-adjusted discharge rates and age-adjusted risk ratios (Poisson) with confidence intervals and p-values Adjust for other relevant variables Explore differences in children, younger and older adults if numbers allow. Numbers are expected to be too small among the youngest (0-4) and the elderly (65+) from the non-white minority ethnic groups.
Denominator Tabulation Analysis	 Linked 2001 census population Person Years adjusted for deaths and migrations For each diagnosis: By sex and ethnic group For each diagnosis or for groups of diagnoses: Incidence (number of first and recurrent events), report absolute numbers Inspect age stratified results (children aged 0-14, in 5 years age band; younger adults aged 15 to 24, adults aged 25 to 64 and older adults aged 65 +, in 10 years age band) – not for disclosure Report differences in age-adjusted discharge rates and age-adjusted risk ratios (Poisson) with confidence intervals and p-values Adjust for other relevant variables Explore differences in children, younger and older adults if numbers allow. Numbers are expected to be too small among the youngest (0-4) and the elderly (65+) from the non-white minority ethnic groups.
Denominator Tabulation Analysis Adjust/stratify	 conditions. * Linked 2001 census population Person Years adjusted for deaths and migrations For each diagnosis: By sex and ethnic group For each diagnosis or for groups of diagnoses: Incidence (number of first and recurrent events), report absolute numbers Inspect age stratified results (children aged 0-14, in 5 years age band; younger adults aged 15 to 24, adults aged 25 to 64 and older adults aged 65 +, in 10 years age band) – not for disclosure Report differences in age-adjusted discharge rates and age-adjusted risk ratios (Poisson) with confidence intervals and p-values Adjust for other relevant variables Explore differences in children, younger and older adults if numbers allow. Numbers are expected to be too small among the youngest (0-4) and the elderly (65+) from the non-white minority ethnic groups.

Table 3: ID diagnostic groups and associated ICD codes for injuries, accident and poisoning

Chapter	ID Group	ICD-10 Codes
XX	External causes of morbidity and mortality	V01-Y98
	Accidents	V01-X59
	Transport accidents	V01-V99
	Pedestrian and cyclist injured in transport accident	V01-V19
	Motorcycle rider and car occupant injured in transport accident	V21-V49
	Other external causes of accidental injuries	W00-X59
	Falls	W00-W19
	Exposure to inanimate mechanical forces (including cut/pierced, Truck by, crushing, machinery)	W20-W49
	Exposure to animate mechanical forces	W50-W64
	Accidental poisoning	X40-X49
	Accidental exposure to other and unspecified factors	X58-X59
	Assault	X85-Y09
XIX	Injury, poisoning and certain other consequences of external causes	S00-T98
	Injury	S00-S99
	Injury of the head	S00-S09
	Injury of the neck	S10-S19
	Injury of the thorax	S20-S29
	Injury of the abdomen, lower back, lumbar spine and pelvis	S30-S39
	Injury of the shoulder and upper arm	S40-S49
	Injury of the elbow and forearm	S50-S59
	Injury of the wrist and hand	S60-S69
	Injury of the hip and thigh	S70-S79
	Injury of the knee and lower leg	S80-S89
	Injury of the ankle and foot	S90-S99
	Burns and corrosions	T20-T32
	Poisoning and toxic effect	T36-T65
	Poisoning by drug, medicaments and biological substances	T36-T50

*The subgroup agreed to:

Exclude all records where there is a cause of death for any intentional harm (ICD10 codes X60-X84).

Exclude records where the underlying cause of death is an 'Undetermined intent', ICD10 codes Y10-Y34.

Include records for ICD10 codes for complications of medical or surgical care (Y40-Y84) and subgroup will review analyses and agree any decisions about including these – or not – for release.

Exclude records for hospital admissions with admission type =31 (patient injury self-inflicted)

Project analysis plan – stage 4: Hospitalisations and deaths due to Infections

Background	Little is known about differences by ethnic group in Scotland in deaths and
	hospitalisation rates due to infections. A recent paper from New Zealand
	by Baker et al (2012) showed marked variations by ethnic group in the
	incidence of hospitalisation for infections.
Aim	Establish the pattern of ethnic differences in the incidence of infections
	hospitalisation and death in Scotland
	1. There are ethnic variations (≥10%) in rates of the above outcomes. We
Hypotheses	hypothesise these will vary between specific ethnic groups and White
	Scottish.
	2. These variations cannot be explained by available covariates
Data and ICD	Linkage census database, SMR01 and death records
codes	ICD codes for all discharge (ICD10) - See table 2 for breakdown
Numerators	(a) 1.First event: hospital discharge or death between May 2001 – April
	2013 (or latest reliable date) and 2. All events: hospital discharge or death
	between May 2001 – April 2013 (excluding second admissions within 30
	days of 1 st admission)
	(b) for any of the 6 discharge diagnosis or any cause of death for the above
	conditions
	(c) 5 years look-back prior to 2001 will be considered for specific infections
	For maternal and perinatal infections, the period of interest will depend
	on the denominator available.
Denominator	Linked 2001 census population – no age restriction
	Person Years adjusted for deaths and migrations
	Maternal and perinatal infections will need separate denominators
	(number of births/mother)
Tabulation	For each diagnosis: By sex and ethnic group
Analysis	For each diagnosis or for groups of diagnoses :
	Incidence (number of first quests) report absolute numbers
	Incluence (number of first events), report absolute numbers
	Benort differences in Age-adjusted discharge rates and Age adjusted risk
	ratios (Poisson) with confidence intervals and n-values
	Adjust for other relevant variables
	Analysis will be done for each specific disease on a case by case basis in
	general when more than 1000 annual cases are available but if the
	prevalence is high in minority ethnic group as for Tuberculosis fewer
	annual cases may be required.
Adjust/stratify	Explore the effect of a range of available covariates

(1) Incidence of hospitalisation and death due to infections, by ethnicity and sex

Table 3: ID diagnostic groups and associated ICD codes for infections

ID Group	ICD10	code title
Enteric infections 1	A00	Cholera
	A01	Typhoid and paratyphoid fevers
	A02	Other salmonella infections
	A03	Shigellosis
	A04	Other bacterial intestinal infections
	A05	Other bacterial foodborne intoxications
	A06	Amoebiasis
	A07	Other protozoal intestinal diseases
	A08	Viral and other specified intestinal infections
Enteric symptoms 2	A09X	Diarrhoea and gastroenteritis of presumed infectious origin
	1880	Nonspecific mesenteric lymphadenitis
	R11X	Nausea and vomiting
	A09	Diarrhoea and gastroenteritis of presumed infectious origin
		(only for death between 2011 and 2013 due to change in ICD10 version used)
Septicaemia 3	A40	Streptococcal septicaemia
	A41	Other septicaemia
STI 4	A50	Congenital syphilis
	A51	Early syphilis
	A52	Late syphilis
	A53	Other and unspecified syphilis
	A54	Gonococcal infection
	A55X	Chlamydial lymphogranuloma (venereum)
	A56	Other sexually transmitted chlamydial diseases
	A57X	Chancroid
	A58X	Granuloma inguinale
	A59	Trichomoniasis
	A60	Anogenital herpesviral [herpes simplex] infection
	A63	Other predominantly sexually transmitted diseases NEC
	A64X	Unspecified sexually transmitted disease
	N290 A	Late syphilis of kidney
HIV/AIDS 5	B20	Human immunodet virus dis result infectious parasitic dis
	B21	Human immunodef virus dis resulting malignant neopl
	B22	Human immunoder virus dis resulting in other spec dis
	B23	Human immunoder virus dis resulting in other conditions
Maningaaaaaal (B24A	Unspecified numan immunodemency virus [H1v] disease
CNS vivel infections 7	A39	A sute persitatio policenzalitica urild virus imported
Civis vir ar infections 7	A801	Acute paralytic poliomyelitis wild virus indigenous
	A802	Acute paralytic poliomyclitis other and unspecified
	A803	Acute panarytic poliomyclitis
	A809	Acute noliparalytic pononiyentis
	A810	Creutzfeldt-Jakob disease
	A811	Subacute sclerosing panencephalitis
	A812	Progressive multifocal leukoencephalopathy
	A818	Other slow virus infections of central nervous system
	A819	Slow virus infection of central nervous system unspecified
	A82	Rabies
	A83	Mosquito-borne viral encephalitis
	A84	Tick-borne viral encephalitis
	A85	Other viral encephalitis not elsewhere classified
	A86X	Unspecified viral encephalitis
	A87	Viral meningitis
	A88	Other viral infections of central nervous system NEC
	A89X	Unspecified viral infection of central nervous system
CNS general infections 8	G00	Bacterial meningitis not elsewhere classified
	G01X A	Meningitis in bacterial diseases classified elsewhere
	G02 A	Meningitis in other infectious and parasitic diseases EC
	G030	Nonpyogenic meningitis
	G039	Meningitis unspecified
	G04	Encephalitis myelitis and encephalomyelitis
	G05 A	Encephalitis myelitis and encephalomyelitis in diseases CE
	G06	Intracranial and intraspinal abscess and granuloma
	GU/X A	A intracranial and intraspinal abscess and granuloma dis EC
	GU8X	Intracranial and intraspinal phiebitis and thrombophiebitis
	G09X	Sequeiae of inflammatory diseases of central nervous system
	0010	Jumani-Dalle Syndrome

Eye infections 9	B30	Viral conjunctivitis
*	H000	Hordeolum and other deep inflammation of eyelid
	H03 A	Disorders of eyelid in diseases classified elsewhere
	H043	Acute and unspecified inflammation of lacrimal passages
	H050	Acute inflammation of orbit
	H100	Mucopurulent conjunctivitis
	H102	Other acute conjunctivitis
	H103	Acute conjunctivitis unspecified
	H109	Conjunctivitis unspecified
	H130 A	Filarial infection of conjunctiva
	H131 A	Conjunctivitis in infectious and parasitic diseases EC
	H160	Corneal ulcer
	H190 A	Scleritis and episcleritis in diseases classified elsewhere
	H191 A	Herpesviral keratitis and keratoconjunctivitis
	H192 A	Keratitis and keratoconjunctivitis oth infec/parasit dis EC
	H220 A	Iridocyclitis in infectious and parasitic diseases EC
	H440	Purulent endophthalmitis
	H451 A	Endophthalmitis in diseases classified elsewhere
Ear infections 10	H600	Abscess of external ear
	H601	Cellulitis of external ear
	H602	Malignant otitis externa
	H603	Other infective otitis externa
	H609	Otitis externa unspecified
	H62 A	Disorders of external ear in diseases classified elsewhere
	H65	Nonsuppurative otitis media
	H66	Suppurative and unspecified otitis media
	H67 A	Otitis media in diseases classified elsewhere
	H680	Eustachian salpingitis
	H70	Mastoiditis and related conditions
	H730	Acute myringitis
	H750 A	A Mastoiditis in infectious and parasitic diseases EC
	H830	Labyrinthitis
	H940 A	Acoustic neuritis in infectious and parasitic diseases EC
Upper RTI 11	JOOX	Acute nasopharyngitis [common cold]
	J01	Acute sinusitis
	J02	Acute pharyngitis
	J03	Acute tonsillitis
	J04	Acute laryngitis and tracheitis
	J05	Acute obstructive laryngitis [croup] and epiglottitis
	J06	Acute upper respiratory infections multiple and unsp sites
	J32	Chronic sinusitis
	J340	Abscess furuncle and carbuncle of nose
	J36X	Peritonsillar abscess
	J3/	Chronic laryngitis and laryngotracheitis
	J390 J201	Retropharyngeal and parapharyngeal abscess
T 1 1 10	J391	Dentropy of pharynx
Tuberculosis 12	AIS	Resp IB bacteriologically and histologically confirmed
	A16	Respiratory IB not confirmed bact or histologically
	AI/D	Tuberculosis of nervous system
	A18	I uberculosis of other organs
	A19 N740 A	Tuberculous infection of corrivatori
	N740 A	Famala tuberculous nelvia inflammatory disease
	165V	Preumogoniosis associated with tuberculosis
A outo I DTI 13	JUJA A 491	
Acute LK1115	A401 A482	Nonpneumonic Legionnaires' disease [Dontiac faver]
	R50Y	Pneumocystosis
	100X	Influenze due te certain identified influenze virus
	110	Influenza due to other identified influenza virus
	J10 J11	Influenza virus not identified
	J12	Viral pneumonia not elsewhere classified
	J13X	Pneumonia due to Streptococcus pneumoniae
	J14X	Pneumonia due to Haemonhilus influenzae
	J15	Bacterial nneumonia not elsewhere classified
	J16	Pneumonia due to other infectious organisms NFC
	J17 A	Pneumonia in diseases classified elsewhere
	118	Pneumonia organism unspecified
	120	Acute bronchitis
	J21	Acute bronchiolitis
	J22X	Unspecified acute lower respiratory infection
	J09	Influenza due to certain identified influenza virus

		(only for death between 2011 and 2013 due to change in ICD10 version used)
	J44	Other chronic obstructive pulmonary disease
		(only for death between 2011 and 2013 due to change in ICD10 version used)
Chronic LRTI 14	J40X	Bronchitis not specified as acute or chronic
	J41	Simple and mucopurulent chronic bronchitis
	J42X	Unspecified chronic bronchitis
	J440	Chronic obstruct pulmonary dis with acute lower resp infec
	J47X	Bronchiectasis
	J85	Abscess of lung and mediastinum
	J86	Pyothorax
	J988	Other specified respiratory disorders
Heart & Circulatory infections 15	B332	Viral carditis
	100X	Rheumatic fever without mention of heart involvement
	101	Rheumatic fever with neart involvement
	102	Rheumatic chorea
	105	Rheumatic nortia valve diseases
	100	Rheumatic aoffic valve diseases
	107	Multiple valve diseases
	100	Other rheumatic heart diseases
	1301	Infective pericarditis
	133	Acute and subacute endocarditis
	135 138X	Endocarditis valve unspecified
	139 - A	Endocarditis and heart valve disorders in diseases EC
	I400	Infective myocarditis
	I410 A	A Myocarditis in bacterial diseases classified elsewhere
	I411 A	A Myocarditis in viral diseases classified elsewhere
	I412 A	A Myocarditis in other infectious and parasitic diseases EC
	I430 A	A Cardiomyopathy in infectious & parasitic diseases CE
	I790 A	Aneurysm of aorta in diseases classified elsewhere
	I791 A	Aortitis in diseases classified elsewhere
Oral infections 16	K02	Dental caries
	K044	Acute apical periodontitis of pulpal origin
	K046	Periapical abscess with sinus
	K050	Acute gingivitis
	K052	Acute periodontitis
	K053	
	K113 K122	Abscess of salivary gland
CI tract infactions 17	K122 K230 A	
	K231 A	Megaoesonhagus in Chagas' disease
	K25	Gastric ulcer
	K26	Duodenal ulcer
	K27	Peptic ulcer site unspecified
	K28	Gastrojejunal ulcer
	K293	Chronic superficial gastritis
	K294	Chronic atrophic gastritis
	K295	Chronic gastritis unspecified
	K35	Acute appendicitis
	K36X	Other appendicitis
	K37X	Unspecified appendicitis
	K61	Abscess of anal and rectal regions
	K630	Abscess of intestine
	K632	Fistula of intestine
	K650	Acute peritonitis
	K0/8 A	Other intertial melaharmian
	K908	The disord intesting periton and measurering glands
Hanatia infactions 19	K950 A	Abseess of liver
Trepatic Infections 18	K770 A	Liver disorders in infectious and parasitic diseases EC
	K830	Cholangitis
Viral hepatitis 19	B15	Acute hepatitis A
	B16	Acute hepatitis B
	B17	Other acute viral hepatitis
	B18	Chronic viral hepatitis
	B19	Unspecified viral hepatitis
Kidney infections 20	N00	Acute nephritic syndrome
	N05	Unspecified nephritic syndrome
	N10X	Acute tubulo-interstitial nephritis
	N136	Pyonephrosis
1	N151	Renal and perinephric abscess
Urinary tract infections 21	N300	Acute cystitis
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	N341	Nonspecific urethritis
	N351	Postinfective urethral stricture not elsewhere classified
	N37 A	Urethral disorders in diseases classified elsewhere
	N390	Urinary tract infection site not specified
Reproductive tract infections Male 22	N410	
Reproductive tract infections what 22	N411	Chronia prostatitia
	N411 N412	
	N412	Abscess of prostate
	N413	Prostatocystitis
	N431	Infected hydrocele
	N45	Orchitis and epididymitis
	N481	Balanoposthitis
	N482	Other inflammatory disorders of penis
	N490	Inflammatory disorders of seminal vesicle
	N49	Inflammatory disorders of male genital organs NEC
	N51 A	Disorders of male genital organs in diseases EC
Reproductive tract infections Female 23	N70	Salpingitis and oophoritis
	N71	Inflammatory disease of uterus except cervix
	N72X	Inflammatory disease of cervix uteri
	N73	Other female pelvic inflammatory diseases
	N74 A	Female pelvic inflammatory disorders in diseases EC
	N751	Absees of Partholin's gland
	N764	Abscess of Datution s gland
	N/04	Abscess of vulva
	IN8/	
Skin infections typical 24	A46X	Erysipelas
	LOOX	Staphylococcal scalded skin syndrome
	L01	Impetigo
	L02	Cutaneous abscess furuncle and carbuncle
	L03	Cellulitis
	L04	Acute lymphadenitis
	L050	Pilonidal cyst with abscess
	L08	Other local infections of skin and subcutaneous tissue
Breast infections 25	N61X	Inflammatory disorders of breast
Osteomyelitis 26	M462	Osteomyelitis of vertebra
v	M463	Infection of intervertebral disc (pyogenic)
	M464	Discitis unspecified
	M465	Other infective spondylonathies
Joint infections 27	M00	Pyogenic arthritis
Some meetions 27	M01 A	Direct infections joint in infectious and parasitic dis EC
Connective tissue infections 28	M021	Postdysenteric arthropathy
Connective tissue infections 28	M021 M022	Poiter's disasse
	M023	Desting estimation and martine arthrough the indianana EC
	MUS A	
	M600	Infective myositis
	M630 A	Myositis in bacterial diseases classified elsewhere
	M631 A	Myositis in protozoal and parasitic infections EC
	M632 A	Myositis in other infectious diseases classified elsewhere
	M650	Abscess of tendon sheath
	M651	Other infective (teno)synovitis
	M680 A	Synovitis and tenosynovitis in bacterial diseases EC
	M710	Abscess of bursa
	M711	Other infective bursitis
	M896	Osteopathy after poliomyelitis
Neoplasms from infection 29	C11	Malignant neoplasm of nasopharynx
	C161	Malignant neoplasm of fundus of stomach
	C162	Malignant neoplasm of body of stomach
	C163	Malignant neoplasm of pyloric antrum
	C164	Malignant neoplasm of pylorus
	C165	Malignant neoplasm of lesser curvature of stomach unsp
	C166	Malignant neoplasm of greater curvature of stomach unsp
	C168	Malignant neonlasm overlapping lesion of stomach
	C169	Malignant neoplasm of stomach unspecified
	C210	Malignant neoplasm of anus unspecified
	C211	Malignant neoplasm of anal canal
	C220	Manghant neoplasm liver cell carainome
	C220	Vangalia saraama
	052	Aposi s sarcoma
	053	Malignant neoplasm of cervix uteri
	D002	Carcinoma in situ stomach
	D013	Carcinoma in situ anus and anal canal
	D 0 C	
	D06	Carcinoma in situ of cervix uteri
Postoperative infections 30	D06 T802	Carcinoma in situ of cervix uteri Infections following infusion transfusion & therap inject

	T826	Infect and inflammatory reaction due to cardiac valve pros
	T827	Infect inflamm reac due oth card vasc devs implant and graft
	T835	Infect inflam react due pros dev implt & graft urinary syst
	T836	Infect inflam react due pros dev implant graft in gen tract
	T845	Infect and inflammatory reaction due to internal joint pros
	T846	Infect and inflamm react due int fixation dev [any site]
	T847	Inf inflam reac due oth int orth prosth devs implts & grfts
	T857	Inf inflamm react due oth int prosth devs implants & grafts
	1874	Infection of amputation stump
Adverse effect of ID treatment 31	R761	Abnormal reaction to tuberculin test
	R762	False-positive serological test for syphilis
	136	Poisoning by systemic antibiotics
	137	Poisoning by oth systemic anti-infective and antiparasitics
	1485	Poisoning by anti-common-cold drugs
	148/	Poisoning by oth & unsp agents prim acting on the resp sys
	1490 T405	Poisoning by local antitung anti-iniec & anti-initiam drg NEC
	1495 T496	Poisoning by topical opninalmological drugs and preparations
	T490	Poisoning by topical dominiolaryingological drugs and preps
	T788	Other adverse effects not elsewhere classified
	T789	Adverse effect unspecified
	T880	Infection following immunization
	T881	Other complications following immunization NEC
	T887	Unspecified adverse effect of drug or medicament
Other bacterial infections 32	A20	Plague
	A21	Tularaemia
	A22	Anthrax
	A23	Brucellosis
	A24	Glanders and melioidosis
	A25	Rat-bite fevers
	A26	Erysipeloid
	A27	Leptospirosis
	A28	Other zoonotic bacterial diseases not elsewhere classified
	A30	Leprosy [Hansen's disease]
	A31	Infection due to other mycobacteria
	A32	
	A33A A24V	
	A34X A35X	Other tetanus
	A36	Diphtheria
	A37	Whooping cough
	A38X	Scarlet fever
	A42	Actinomycosis
	A43	Nocardiosis
	A44	Bartonellosis
	A480	Gas gangrene
	A483	Toxic shock syndrome
	A484	Brazilian purpuric fever
	A488	Other specified bacterial diseases
	A49	Bacterial infection of unspecified site
	A65X	Nonvenereal syphilis
	A66	Yaws
	A67	Pinta [carate]
	A68	Relapsing fevers
	A69	Other spirochaetal infections
	A/0A	
	A/1 A74	Other diseases equised by ablemydiae
	A75	Typhus fever
	A77	Snotted fever [tick-borne rickettsioses]
	A78X	O fever
	A79	Other rickettsjoses
	B95	Strep and staph as cause of dis classified other chapters
	B96	Oth bact agents as cause of dis classified to oth chapters
Other viral infections 33	A90X	Dengue fever [classical dengue]
	A91X	Dengue haemorrhagic fever
	A92	Other mosquito-borne viral fevers
	A93	Other arthropod-borne viral fevers not elsewhere classified
	A94X	Unspecified arthropod-borne viral fever
	A95	Yellow fever
	A96	Arenaviral haemorrhagic fever

	A98	Other viral haemorrhagic fevers not elsewhere classified
	A99X	Unspecified viral haemorrhagic fever
	B00	Herpesviral [herpes simplex] infections
	B01	Varicella [chickenpox]
	B02	Zoster [herpes zoster]
	B03X	Smallpox
	B04X	Monkeypox
	B05	Measles
	B06	Rubella [German measles]
	B07X	Viral warts
	B08	Oth viral inf characterized skin / mucous membr les NEC
	B09X	Unspec viral inf characterized skin / mucous membr lesions
	B25	Cytomegaloviral disease
	B26	Mumps
	B27	Infectious mononucleosis
	B33	Other viral diseases not elsewhere classified
	B34	Viral infection of unspecified site
	B97	Viral agents as cause of dis class to other chapters
Other mycoses 34	B35	Dermatophytosis
	B36	Other superficial mycoses
	B37	Candidiasis
	B38	Coccidioidomycosis
	B39	Histoplasmosis
	B40	Blastomycosis
	B41	Paracoccidioidomycosis
	B42	Sporotrichosis
	B43	Chromomycosis and phaeomycotic abscess
	B44	Aspergillosis
	B45	Cryptococcosis
	B46	Zygomycosis
	B47	Mycetoma
	B48	Other mycoses not elsewhere classified
	B49X	Unspecified mycosis
Other protozoal infections 35	B50	Plasmodium faiciparum maiaria
	B51	Plasmodium vivax malaria
	B52	Plasmoolum malariae malaria
	D33	
	D34A D55	
	D 55	
	B56	
	B56 B57	Chagas' disease
	B56 B57 B58	Chagas' disease
	B56 B57 B58 B60	African trypanosomiasis Chagas' disease Toxoplasmosis Other protozoal diseases not elsewhere classified
	B56 B57 B58 B60 B64X	African trypanosomasis Chagas' disease Toxoplasmosis Other protozoal diseases not elsewhere classified Unspecified protozoal disease
Infections of pregnancy and	B56 B57 B58 B60 B64X	African trypanosomasis Chagas' disease Toxoplasmosis Other protozoal diseases not elsewhere classified Unspecified protozoal disease
Infections of pregnancy and puerperium 36	B56 B57 B58 B60 B64X O030	African trypanosonnasis Chagas' disease Toxoplasmosis Other protozoal diseases not elsewhere classified Unspecified protozoal disease Incomplete spont abort comp by genital tract & pelvic infec
Infections of pregnancy and puerperium 36	B56 B57 B58 B60 B64X O030 O035	African trypanosonnasis Chagas' disease Toxoplasmosis Other protozoal diseases not elsewhere classified Unspecified protozoal disease Incomplete spont abort comp by genital tract & pelvic infec Complete or unsp spont abort comp by gen tract & pelvic infn
Infections of pregnancy and puerperium 36	B56 B57 B58 B60 B64X O030 O035 O050	African trypanosonnasis Chagas' disease Toxoplasmosis Other protozoal diseases not elsewhere classified Unspecified protozoal disease Incomplete spont abort comp by genital tract & pelvic infec Complete or unsp spont abort comp by gen tract & pelvic infn Incomplete other abortion comp by genital tract & pelvic inf
Infections of pregnancy and puerperium 36	B56 B57 B58 B60 B64X O030 O035 O050 O055	African trypanosonnasis Chagas' disease Toxoplasmosis Other protozoal diseases not elsewhere classified Unspecified protozoal disease Incomplete spont abort comp by genital tract & pelvic infec Complete or unsp spont abort comp by gen tract & pelvic infn Incomplete other abortion comp by genital tract & pelvic inf Complete/unsp other abortion comp by gen tract & pelvic infn
Infections of pregnancy and puerperium 36	B56 B57 B58 B60 B64X O030 O035 O050 O055 O060	African trypatosonnasis Chagas' disease Toxoplasmosis Other protozoal diseases not elsewhere classified Unspecified protozoal disease Incomplete spont abort comp by genital tract & pelvic infec Complete or unsp spont abort comp by gen tract & pelvic infn Incomplete other abortion comp by genital tract & pelvic infn Complete/unsp other abortion comp by gen tract & pelvic infn Incomplete unspec abortion comp by genital tract & pelvic infn
Infections of pregnancy and puerperium 36	B56 B57 B58 B60 B64X 0030 0035 0050 0055 0060 0065	African trypatosonnasis Chagas' disease Toxoplasmosis Other protozoal diseases not elsewhere classified Unspecified protozoal disease Incomplete spont abort comp by genital tract & pelvic infec Complete or unsp spont abort comp by gen tract & pelvic infn Incomplete other abortion comp by genital tract & pelvic infn Complete/unsp other abortion comp by genital tract & pelvic infn Incomplete unspec abortion comp by genital tract & pelvic infn Unspec abort complete/unspec comp by gen tract & pelvic inf
Infections of pregnancy and puerperium 36	B56 B57 B58 B60 B64X 0030 0035 0050 0055 0060 0065 0070	African trypatosonnasis Chagas' disease Toxoplasmosis Other protozoal diseases not elsewhere classified Unspecified protozoal disease Incomplete spont abort comp by genital tract & pelvic infec Complete or unsp spont abort comp by gen tract & pelvic infn Incomplete other abortion comp by genital tract & pelvic infn Incomplete/unsp other abortion comp by gen tract & pelvic infn Incomplete unspec abortion comp by genital tract & pelvic infn Unspec abort complete/unspec comp by gen tract & pelvic inf Failed medical abortion complic by genital tract/pelvic infn
Infections of pregnancy and puerperium 36	B56 B57 B58 B60 B64X 0030 0035 0050 0055 0060 0065 0070 0075	African trypatosonnasis Chagas' disease Toxoplasmosis Other protozoal diseases not elsewhere classified Unspecified protozoal disease Incomplete spont abort comp by genital tract & pelvic infec Complete or unsp spont abort comp by gen tract & pelvic infn Incomplete other abortion comp by genital tract & pelvic inf Complete/unsp other abortion comp by gen tract & pelvic infn Incomplete unspec abortion comp by genital tract & pelvic infn Unspec abort complete/unspec comp by gen tract & pelvic inf Failed medical abortion complic by genital tract/pelvic infn Oth and unsp faild attempt abort comp gen tract/pelvic inf
Infections of pregnancy and puerperium 36	B56 B57 B58 B60 B64X 0030 0035 0050 0055 0060 0065 0070 0075 0080	African trypatosonnasis Chagas' disease Toxoplasmosis Other protozoal diseases not elsewhere classified Unspecified protozoal disease Incomplete spont abort comp by genital tract & pelvic infec Complete or unsp spont abort comp by gen tract & pelvic infn Incomplete other abortion comp by genital tract & pelvic infn Incomplete/unsp other abortion comp by gen tract & pelvic infn Incomplete unspec abortion comp by genital tract & pelvic infn Unspec abort complete/unspec comp by gen tract & pelvic inf Failed medical abortion complic by genital tract/pelvic infn Oth and unsp faild attempt abort comp gen tract/pelvic inf Gen tract and pelv infect follow abort/ectop and molar preg
Infections of pregnancy and puerperium 36	B56 B57 B58 B60 B64X 0030 0035 0050 0060 0065 0070 0075 0080 0040	African trypatosonnasis Chagas' disease Toxoplasmosis Other protozoal diseases not elsewhere classified Unspecified protozoal disease Incomplete spont abort comp by genital tract & pelvic infec Complete or unsp spont abort comp by gen tract & pelvic infn Incomplete other abortion comp by genital tract & pelvic inf Complete/unsp other abortion comp by gen tract & pelvic infn Incomplete unspec abortion comp by gen tract & pelvic inf Failed medical abortion complic by genital tract/pelvic infn Oth and unsp faild attempt abort comp gen tract/pelvic inf Gen tract and pelv infect follow abort/ectop and molar preg Incomplete med abort comp by genital tract & pelvic infec
Infections of pregnancy and puerperium 36	B56 B57 B58 B60 B64X 0030 0035 0050 0060 0065 0070 0075 0080 0040	African trypatosonnasis Chagas' disease Toxoplasmosis Other protozoal diseases not elsewhere classified Unspecified protozoal disease Incomplete spont abort comp by genital tract & pelvic infec Complete or unsp spont abort comp by gen tract & pelvic infn Incomplete other abortion comp by genital tract & pelvic inf Complete/unsp other abortion comp by gen tract & pelvic infn Incomplete unspec abortion comp by gen tract & pelvic inf Incomplete unspec abortion comp by gen tract & pelvic inf Failed medical abortion complic by genital tract/pelvic infn Oth and unsp faild attempt abort comp gen tract/pelvic inf Gen tract and pelv infect follow abort/ectop and molar preg Incomplete or unspec med abort comp by gen tract & pelvic infec
Infections of pregnancy and puerperium 36	B56 B57 B58 B60 B64X 0030 0035 0050 0060 0065 0070 0075 0080 0040 0045 023	Afficiant typanosonnasis Chagas' disease Toxoplasmosis Other protozoal diseases not elsewhere classified Unspecified protozoal disease Incomplete spont abort comp by genital tract & pelvic infec Complete or unsp spont abort comp by gen tract & pelvic infn Incomplete other abortion comp by genital tract & pelvic infn Incomplete/unsp other abortion comp by gen tract & pelvic infn Incomplete unspec abortion comp by genital tract & pelvic inf Failed medical abortion complic by genital tract/pelvic infn Oth and unsp faild attempt abort comp gen tract/pelvic inf Gen tract and pelv infect follow abort/ectop and molar preg Incomplete or unspec med abort comp by gen tract & pelvic infn Oth and unsp faild attempt abort comp by gen tract & pelvic infn Incomplete med abort comp by genital tract/pelvic infn Incomplete or unspec med abort comp by genital tract & pelvic infn Incomplete or unspec med abort comp by genital tract & pelvic infn
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Infections of pregnancy and puerperium 36	B56 B57 B58 B60 B64X 0030 0035 0050 0060 0065 0070 0075 0080 0045 023 0411 0753	Afficiant typanosonnasis Chagas' disease Toxoplasmosis Other protozoal diseases not elsewhere classified Unspecified protozoal disease Incomplete spont abort comp by genital tract & pelvic infec Complete or unsp spont abort comp by gen tract & pelvic infn Incomplete or unsp spont abort comp by gen tract & pelvic infn Incomplete or unsp spont abort comp by gen tract & pelvic infn Incomplete unspec abortion comp by gen tract & pelvic infn Incomplete unspec abortion comp by gen tract & pelvic inf Failed medical abortion complic by genital tract/pelvic infn Oth and unsp faild attempt abort comp gen tract/pelvic infn Oth and unsp faild attempt abort comp gen tract & pelvic infn Gen tract and pelv infect follow abort/ectop and molar preg Incomplete or unspec med abort comp by gen tract & pelvic infn Infections of genitourinary tract in pregnancy Infection of amniotic sac and membranes Other infection during labour
Infections of pregnancy and puerperium 36	B56 B57 B58 B60 B64X 0030 0035 0050 0055 0060 0065 0070 0075 0080 0045 023 0411 0753 085X	Afficial trypatosomasis Chagas' disease Toxoplasmosis Other protozoal diseases not elsewhere classified Unspecified protozoal disease Incomplete spont abort comp by genital tract & pelvic infn Incomplete or unsp spont abort comp by gen tract & pelvic infn Incomplete other abortion comp by genital tract & pelvic infn Incomplete/unsp other abortion comp by gen tract & pelvic infn Incomplete unspec abortion comp by genital tract & pelvic infn Incomplete unspec abortion comp by genital tract & pelvic infn Incomplete unspec abortion comp by gen tract & pelvic inf Failed medical abortion complic by genital tract/pelvic infn Oth and unsp faild attempt abort comp gen tract/pelvic inff Gen tract and pelv infect follow abort/ectop and molar preg Incomplete med abort comp by gen tract & pelvic infn Infections of genitourinary tract in pregnancy Infection of amniotic sac and membranes Other infection during labour Puerperal sepsis
Infections of pregnancy and puerperium 36	B56 B57 B58 B60 B64X 0030 0035 0050 0055 0060 0065 0070 0075 0080 0045 023 0411 0753 085X 086	Affician tryparosonnasis Chagas' disease Toxoplasmosis Other protozoal diseases not elsewhere classified Unspecified protozoal disease Incomplete spont abort comp by genital tract & pelvic infec Complete or unsp spont abort comp by gen tract & pelvic infn Incomplete other abortion comp by genital tract & pelvic infn Complete/unsp other abortion comp by gen tract & pelvic infn Incomplete unspec abortion comp by genital tract & pelvic infn Incomplete unspec abortion comp by genital tract & pelvic infn Incomplete unspec abortion comp by genital tract & pelvic infn Failed medical abortion complic by genital tract/pelvic infn Oth and unsp faild attempt abort comp gen tract/pelvic inff Gen tract and pelv infect follow abort/ectop and molar preg Incomplete med abort comp by gen tract & pelvic infn Infections of genitourinary tract in pregnancy Infection of amniotic sac and membranes Other infection during labour Puerperal sepsis Other puerperal infections
Infections of pregnancy and puerperium 36	B56 B57 B58 B60 B64X 0030 0035 0050 0055 0060 0065 0070 0075 0080 0045 023 0411 0753 085X 086 0910	Affician tryparosonnasis Chagas' disease Toxoplasmosis Other protozoal diseases not elsewhere classified Unspecified protozoal disease Incomplete spont abort comp by genital tract & pelvic infec Complete or unsp spont abort comp by gen tract & pelvic infn Incomplete other abortion comp by genital tract & pelvic infn Complete/unsp other abortion comp by gen tract & pelvic infn Incomplete unspec abortion comp by genital tract & pelvic infn Incomplete unspec abortion comp by gen tract & pelvic infn Incomplete unspec abortion comp by genital tract & pelvic inf Failed medical abortion complic by genital tract/pelvic infn Oth and unsp faild attempt abort comp gen tract/pelvic inff Gen tract and pelv infect follow abort/ectop and molar preg Incomplete or unspec med abort comp by gen tract & pelvic infn Infections of genitourinary tract in pregnancy Infection of amniotic sac and membranes Other infection during labour Puerperal sepsis Other puerperal infections Infection of nipple associated with childbirth
Infections of pregnancy and puerperium 36	B56 B57 B58 B60 B64X 0030 0035 0050 0055 0060 0065 0070 0075 0080 0045 023 0411 0753 085X 086 0910 0911	African tryparosonnasis Chagas' disease Toxoplasmosis Other protozoal diseases not elsewhere classified Unspecified protozoal disease Incomplete spont abort comp by genital tract & pelvic infec Complete or unsp spont abort comp by gen tract & pelvic infn Incomplete other abortion comp by gen tract & pelvic infn Incomplete unspec abortion comp by gen tract & pelvic infn Incomplete unspec abortion comp by gen tract & pelvic infn Incomplete unspec abortion comp by gen tract & pelvic inf Failed medical abortion comp by gen tract & pelvic inf Failed medical abortion comp by gen tract & pelvic inf Gen tract and pelv infect follow abort/cetop and molar preg Incomplete or unspec med abort comp by gen tract & pelvic infn Other at and pelv infect follow abort/cetop and molar preg Incomplete or unspec med abort comp by gen tract & pelvic infn Infections of genitourinary tract in pregnancy Infection of amniotic sac and membranes Other infection during labour Puerperal sepsis Other puerperal infections Infection of nipple associated with childbirth Abscess of breast associated with childbirth
Infections of pregnancy and puerperium 36	B56 B57 B58 B60 B64X 0030 0035 0050 0055 0060 0065 0070 0075 0080 0041 0753 085X 086 0910 0911 0912	Antean tryparosonnasis Chagas' disease Toxoplasmosis Other protozoal diseases not elsewhere classified Unspecified protozoal disease Incomplete spont abort comp by genital tract & pelvic infec Complete or unsp spont abort comp by gen tract & pelvic infn Incomplete other abortion comp by genital tract & pelvic infn Incomplete unspec abortion comp by gen tract & pelvic infn Incomplete unspec abortion comp by genital tract & pelvic infn Incomplete unspec abortion comp by genital tract & pelvic inf Failed medical abortion comp by genital tract/pelvic infn Oth and unsp faild attempt abort comp gen tract/pelvic inf Gen tract and pelv infect follow abort/ectop and molar preg Incomplete or unspec med abort comp by gen tract & pelvic infnc Infections of genitourinary tract in pregnancy Infection of amniotic sac and membranes Other infection during labour Puerperal sepsis Other puerperal infections Infection of nipple associated with childbirth Abscess of breast associated with childbirth Nonpurulent mastitis associated with childbirth
Infections of pregnancy and puerperium 36	B56 B57 B58 B60 B64X 0030 0035 0050 0055 0060 0065 0070 0075 0080 0041 0753 085X 086 0910 0911 0922	Antean tryparosonnasis Chagas' disease Toxoplasmosis Other protozoal diseases not elsewhere classified Unspecified protozoal disease Incomplete spont abort comp by genital tract & pelvic infec Complete or unsp spont abort comp by gen tract & pelvic infn Incomplete other abortion comp by gen tract & pelvic infn Incomplete unspec abortion comp by gen tract & pelvic infn Incomplete unspec abortion comp by gen tract & pelvic inf Failed medical abortion comp by gen tract & pelvic inf Failed medical abortion complex gen tract/pelvic infn Oth and unsp faild attempt abort comp gen tract/pelvic infn Oth and unsp faild attempt abort comp gen tract & pelvic infec Complete or unspec med abort comp by gen tract & pelvic inffn Oth and unsp faild attempt abort comp gen tract & pelvic infn Infections of genitourinary tract in pregnancy Infection of amniotic sac and membranes Other infection during labour Puerperal sepsis Other puerperal infections Infection of nipple associated with childbirth Abscess of breast associated with childbirth Nonpurulent mastitis associated with childbirth Mat infect and parasitic dis EC comp preg/childbirth/puerp
Infections of pregnancy and puerperium 36	B56 B57 B58 B60 B64X 0030 0035 0050 0055 0060 0065 0070 0075 0080 0041 0753 085X 086 0910 0911 0912 098 P002	African dypanosonnasis Chagas' disease Toxoplasmosis Other protozoal diseases not elsewhere classified Unspecified protozoal disease Incomplete spont abort comp by genital tract & pelvic infec Complete or unsp spont abort comp by gen tract & pelvic infn Incomplete other abortion comp by gen tract & pelvic infn Incomplete unspec abortion comp by gen tract & pelvic infn Incomplete unspec abortion comp by gen tract & pelvic inf Failed medical abortion complic by genital tract/pelvic infn Oth and unsp faild attempt abort comp gen tract/pelvic inf Gen tract and pelv infect follow abort/ectop and molar preg Incomplete or unspec med abort comp by gen tract & pelvic infn Other abort comp by gen tract & pelvic infn Oth and unsp faild attempt abort comp gen tract/pelvic inf Gen tract and pelv infect follow abort/ectop and molar preg Incomplete or unspec med abort comp by gen tract & pelvic infn Infections of genitourinary tract in pregnancy Infection of amniotic sac and membranes Other infection during labour Puerperal sepsis Other puerperal infections Infection of nipple associated with childbirth Abscess of breast associated with childbirth Nonpurulent ma
Infections of pregnancy and puerperium 36	B56 B57 B58 B60 B64X 0030 0035 0050 0055 0060 0065 0070 0075 0080 0041 0753 085X 086 0910 0911 0912 098 P002 P027	Arrican tryparosonnasis Chagas' disease Toxoplasmosis Other protozoal diseases not elsewhere classified Unspecified protozoal disease Incomplete spont abort comp by genital tract & pelvic infec Complete or unsp spont abort comp by gen tract & pelvic infn Incomplete other abortion comp by gen tract & pelvic infn Incomplete unspec abortion comp by gen tract & pelvic infn Incomplete unspec abortion comp by gen tract & pelvic inf Failed medical abortion complic by genital tract/pelvic infn Oth and unsp faild attempt abort comp gen tract/pelvic inf Gen tract and pelv infect follow abort/ectop and molar preg Incomplete or unspec med abort comp by gen tract & pelvic infn Oth and unsp faild attempt abort comp by gen tract & pelvic infn Infections of genitourinary tract in pregnancy Infection of amniotic sac and membranes Other infection during labour Puerperal sepsis Other puerperal infections Infection of nipple associated with childbirth Abscess of breast associated with childbirth Mati infect and parasitic dis EC comp preg/childbirth/puerp Fetus and newborn affected by chorioamnionitis
Infections of pregnancy and puerperium 36	B56 B57 B58 B60 B64X 0030 0035 0050 0055 0060 0065 0070 0075 0080 0041 0753 085X 086 0910 0911 0912 098 P002 P027 P23 B25	Arrican tryparosonnasis Chagas' disease Toxoplasmosis Other protozoal diseases not elsewhere classified Unspecified protozoal disease Incomplete spont abort comp by genital tract & pelvic infec Complete or unsp spont abort comp by gen tract & pelvic infn Incomplete other abortion comp by gen tract & pelvic inf Complete/unsp other abortion comp by gen tract & pelvic inf Incomplete unspec abortion comp by gen tract & pelvic inf Incomplete unspec abortion comp by gen tract & pelvic inf Failed medical abortion complic by genital tract/pelvic infn Oth and unsp faild attempt abort comp gen tract/pelvic inf Gen tract and pelv infect follow abort/ectop and molar preg Incomplete or unspec med abort comp by gen tract & pelvic infn Infection of genitourinary tract in pregnancy Infection of amniotic sac and membranes Other infection during labour Puerperal sepsis Other puerperal infections Infection of nipple associated with childbirth Abscess of breast associated with childbirth Nonpurulent mastitis associated with childbirth Mat infect and parasitic dis EC comp preg/childbirth/puerp Fetus and newborn affected by chorioamnionitis Congenital pneumonia
Infections of pregnancy and puerperium 36	B56 B57 B58 B60 B64X 0030 0035 0050 0055 0060 0065 0070 0075 0080 0040 0045 023 0411 0753 085X 086 0910 0912 098 P002 P23 P35	African dypanosoniasis Chagas' disease Toxoplasmosis Other protozoal diseases not elsewhere classified Unspecified protozoal disease Incomplete spont abort comp by genital tract & pelvic infec Complete or unsp spont abort comp by gen tract & pelvic infn Incomplete other abortion comp by genital tract & pelvic inf Complete unspec abortion comp by gen tract & pelvic inf Incomplete unspec abortion comp by gen tract & pelvic inf Failed medical abortion complic by genital tract & pelvic inf Failed medical abortion complic by genital tract/pelvic inf Gen tract and pelv infect follow abort/cetop and molar preg Incomplete or unspec med abort comp by gen tract & pelvic infn Other and unsp faild attempt abort comp by gen tract & pelvic infn Gen tract and pelv infect follow abort/cetop and molar preg Incomplete or unspec med abort comp by gen tract & pelvic infn Infections of genitourinary tract in pregnancy Infection of amniotic sac and membranes Other infection during labour Puerperal sepsis Other puerperal infections Infection of nipple associated with childbirth Abscess of breast associated with childbirth Nonpurulent mastitis associated with childbirth
Infections of pregnancy and puerperium 36	B56 B57 B58 B60 B64X 0030 0035 0050 0055 0060 0065 0070 0075 0080 0040 0045 023 0411 0753 085X 086 0910 0912 098 P002 P027 P23 P35 P36	African dypanosonnasis Chagas' disease Toxoplasmosis Other protozoal diseases not elsewhere classified Unspecified protozoal disease Incomplete spont abort comp by genital tract & pelvic infec Complete or unsp spont abort comp by gen tract & pelvic inf Incomplete other abortion comp by genital tract & pelvic inf Complete/unsp other abortion comp by gen tract & pelvic inf Incomplete unspec abortion comp by gen tract & pelvic inf Failed medical abortion comp by genital tract & pelvic inf Failed medical abortion complic by genital tract/pelvic inf Gen tract and pelv infect follow abort/cetop and molar preg Incomplete or unspec med abort comp by gen tract & pelvic infn Other and unsp faild attempt abort comp by gen tract & pelvic infn Infections of genitourinary tract in pregnancy Infection of amniotic sac and membranes Other infection during labour Puerperal sepsis Other puerperal infections Infection of nipple associated with childbirth Abscess of breast associated with childbirth Mat infect and parasitic dis EC comp preg/childbirth/puerp Fetus and newborn affected by mat infect and parasitic dis Fetus and newborn affected by chorioamnionitis Congen

	P38X	Omphalitis of newborn with or without mild haemorrhage
	P39	Other infections specific to the perinatal period
ID treatment and prevention 38	B94	Sequelae of oth and unspec infectious and parasitic dis
	Z030	Observation for suspected tuberculosis
	Z21X	Asymptomatic human immunodef virus [HIV] infect status
Other IDs 39	B65	Schistosomiasis [bilharziasis]
	B66	Other fluke infections
	B67	Echinococcosis
	B68	Taeniasis
	B69	Cysticercosis
	B70	Diphyllobothriasis and sparganosis
	B71	Other cestode infections
	B72X	Dracunculiasis
	B73X	Onchocerciasis
	B74	Filariasis
	B75X	Trichinellosis
	B76	Hookworm diseases
	B77	Ascariasis
	B78	Strongyloidiasis
	B79X	Trichuriasis
	B80X	Enterobiasis
	B81	Other intestinal helminthiases not elsewhere classified
	B82	Unspecified intestinal parasitism
	B83	Other helminthiases
	B85	Pediculosis and phthiriasis
	B86X	Scabies
	B87	Myiasis
	B88	Other infestations
	B89X	Unspecified parasitic disease
	B94	Sequelae of oth and unspec infectious and parasitic dis
	B99X	Other and unspecified infectious diseases
	E033	Postinfectious hypothyroidism
	E321	Abscess of thymus
	F024 A	Dementia in human immunodef virus [HIV] disease
	F071	Postencephalitic syndrome
	I88	Nonspecific lymphadenitis
	T64X	Toxic effect of aflatoxin and other mycotoxin food contams

Area: infections – Blood borne viruses (HIV, Hepatitis B and Hepatitis C)

(Health Protection Scotland HSP records)

Background

The Sexual Health and Blood Borne Virus Framework

(http://www.scotland.gov.uk/Publications/2011/08/24085708/0) sets out the Scottish Government's agenda for tackling blood borne viruses (BBV; namely HIV, hepatitis C and hepatitis B). The Framework adopts an outcome based approach to improve health and wellbeing in Scotland, with a strong focus on challenging inequalities. Understanding the ethnic variation associated with BBV infections in Scotland is crucial to inform the development of testing, treatment and care services and thus achieve the outcomes listed in the Framework, specifically in respect of reducing the health inequalities gap and that people affected by BBV lead longer, healthier lives. The planned linkage of BBV databases in SHELS4 will therefore provide key data on ethnicity and country of birth (otherwise unavailable), to inform Government, NHS Boards and other stakeholders on the delivery of BBV services in Scotland.

Preliminary analysis

- a) Exploration of linkage rate to the CHI of each BBV dataset using ethnicity and country of birth information available within each dataset
- b) Exploration of linkage rate to the Census (as explained in 3.3c) generally as well as using ethnicity derived from Onomap.
- c) Descriptive analysis (as explained in 4.2)

Objectives

- a) Explore ethnic inequalities in diagnosis prevalence, in diagnosis incidence, in late diagnosis incidence, in attendance at specialist services and in antiviral treatment in following conditions*:
 - Hepatitis C
 - HIV
 - Hepatitis B

*when the data are available; the reference group being White Scottish

- b) Analyse by sex if numbers allow and examine the potential effect of available covariates (see next page)
- c) Repeat the analysis and explore differences by country of birth.

Outcomes

- a) 1st diagnosis disease-specific
 - Prior to Census (up to April 2001) to get prevalent cases
 - Over study period (1/5/2001 30/4/2013 or latest reliable date)
 - In the community vs. in the hospital/routine screen
- b) Late diagnosis disease-specific (identified by adverse disease related outcome, defined below in tables)
- c) Attendance at specialist services (HCV and HIV)
 - Proportion attending specialist services within 1 year of initial diagnosis
 - Time to attendance: Hazard Ratios of attendance within 1 year of initial diagnosis (censored at 1 year) or any time after initial diagnosis (complete follow-up period)
- d) Treatment with antiviral therapy (HCV)
 - Time to therapy: Hazard Ratios of initiation on therapy within 1 year of attending specialist services (censored at 1 year) or any time after attending specialist services (complete follow-up period)

Main covariates (sex stratified)

• Age

Socioeconomic variables which will be added in the regression analysis if assessed as having a consistent and positive association with the outcome across ethnic group: For population of any age:

- Area based socioeconomic status: Scottish Index of Multiple Deprivation (SIMD)
- House ownership
- Highest qualification (household)

We will also investigate the use of a combined individual and household level education where the individual level of education is used for people aged 16-74 and the household level for children and elderly.

For adult population (restricted to 16-74 years old):

- Highest qualification (individual)
- Economy activity in the previous week of census completion

Other covariates:

- Risk group (available only for BBV diagnosed cases)
- Urban/rural indicator
- Health board (grouped either as GGC/other or 4 largest NHS Boards/other)

Project analysis plan – stage 5a: Prevalence and Incidence of diagnosis with Hepatitis C, HIV and Hepatitis B

Background	See above.
Aims	Establish the pattern of ethnic differences in the prevalence and incidence of being diagnosed for Hepatitis C, HIV and Hepatitis B in Scotland.
	Generate the prevalence rate ratios (PRR) and relative risks of being diagnosed with Hepatitis C, HIV and Hepatitis B for the linked Census population in each ethnic group stratified by sex and adjusted for covariates (e.g age, socio-economic status, health board).

(1) Prevalence and Incidence of BBV diseases diagnosed by ethnicity and sex

	Repeat by country of birth instead of ethnicity.
	1. There are ethnic variations in prevalence and incidence of getting
Hypotheses	diagnosed with Hepatitis C, HIV and Hepatitis B. We hypothesise
	these vary between specific ethnic group and White Scottish.
	2. At the time of first diagnosis, compared to White Scottish people,
	people from ethnic minority groups have a different proportion of
	being diagnosed in the community or in hospital setting.
	3. These variations cannot be explained by available covariates (e.g.
	age, socio-economic status, health board).
	4. Similar hypothesis with COB
Data and ICD	Linkage census database, BBV databases and ACaDMe
codes	
	3 linked datasets for :
	- Hepatitis C (HCV)
	- HIV
	- Hepatitis B (HBV)
Numerator	(a) Prevalence (for HCV, HIV): People diagnosed disease-positive for
	a specific disease prior to the Census (up to April 2001)
	(b) Incidence (for HCV, HIV, HBV): People diagnosed disease-positive
	for a specific disease between May 2001 – April 2013 (or latest
	reliable date)
	(c) Further analysis: People diagnosed in the community (GP, other)
	versus in the hospital/routine screen
	Definition of diagnosed disease-positive:
	 For HCV: PCR positive and/or Antibody positive
	- For HBV: HBV surface Antigen positive
Denominator	(a) Linked 2001 census population (N)
	(b) Linked 2001 census population

	Person-Years (PY) excluding those who have already been diagnosed
	prior to the Census and adjusted for deaths, leaving NHS Scotland
	and incident event.
	No age restriction (except for HIV, database confined to age >14)
	(c) All people diagnosed disease-positive for a specific disease and
	linked to Census.
Tabulation	For each diagnosis: by sex and ethnicity
Analysis	For each diagnosis, by sex:
	1- By ethnicity:
	- Number of cases (Total, prior Census 2001, since Census 2001)
	 Tabulate for age, socio-economic status and health board
	- Poisson regression of number of cases (with confidence intervals
	and p-values) adjusted for age and other relevant covariates.
	Interaction will be considered if numbers allow.
	Goodness of fit statistics
	2- Ву СОВ
	Same type of analysis as 1
Adjust/stratify	Explore the effect of available covariates such as socio-economic
	factors and health board.
Additional	<u>Further analysis:</u> Information on the HIV database on location
comments	(community vs other) very questionable. For HBV, antenatal
	screening could either be in the community or in a hospital setting.
	Consider analysing changes over calendar time for (b) and calendar
	year of diagnosis for (c), if numbers allow.

Project analysis plan – stage 5b: Incidence of late diagnosis with Hepatitis C, HIV and Hepatitis B

Background	See above.
Aims	Establish the pattern of ethnic differences in the incidence of being diagnosed late for Hepatitis C, HIV and Hepatitis B in Scotland.
	Generate the relative risk of being diagnosed late with Hepatitis C, HIV and Hepatitis B for the linked Census population and for those diagnosed, in each ethnic group stratified by sex and adjusted for covariates (e.g age, socio-economic status, health board).
	Repeat by country of birth instead of ethnicity.
Hypotheses	 There are ethnic variations in the incidence of getting diagnosed late with Hepatitis C, HIV and Hepatitis B. We hypothesise these vary between specific ethnic group and White Scottish. These variations cannot be explained by available covariates (e.g age, socio-economic status, health board).
Data and ICD	Linkage census database. BBV databases and ACaDMe
codes	3 linked datasets for : - Hepatitis C (HCV) - HIV - Hepatitis B (HBV)
Numerator	 (a) Incidence (for HCV, HIV, HBV): People diagnosed late for a specific disease between May 2001 – April 2013 (or latest reliable date) (b) Incidence for any case diagnosed (for HCV, HIV): People diagnosed late for a specific disease at any time point <u>Definition of late diagnosis:</u> <u>For HCV:</u> diagnosed HCV-positive and having an end-stage liver disease (ESLD)-related hospitalization and/or death within either 1 or 2* years of diagnosis <u>For HIV:</u> diagnosed HIV positive and having either (a) a low CD4-cell count or (b) a record of disease progression to AIDS, at the time of diagnosis (i.e. within 1 month of diagnosis) - <u>For HBV:</u> diagnosed HBV-positive and having an ESLD-related hospitalization and/or death within either 1 or 2* years of diagnosed
	numbers involved.
Denominator	People diagnosed disease-positive for a specific disease and linked

(1) Incidence of BBV diseases diagnosed late by ethnicity by age and sex

	(a) For diagnosis between May 2001 and April 2013 (or latest reliable
	date)
	PY calculated over the period of late diagnosis identification (1 month, 1 or 2 years) and adjusted for death, leaving NHS Scotland and late diagnosis.
	For HIV, with valid information on CD4-cell count at time of HIV diagnosis.
Tabulation	For each diagnosis: by sex and ethnicity
Analysis	For each diagnosis, by sex:
	1 Du otholoitu
	- Number of cases (since Census 2001)
	- Tabulate for age, socio-economic status and health board
	 Poisson regression of number of cases (with confidence intervals and p-values) adjusted for age and other relevant covariates. Interaction will be considered if numbers allow. Goodness of fit statistics
	2- By COB
Adjust/stratify	Explore the effect of available covariates such as socio-economic factors and health board.
Additional	For HBV and HCV, explore the possibility of defining a late diagnosis
comments	within 2 years of initial diagnosis if numbers are low within 1 year of
	initial diagnosis.
	Univ 1 late diagnosis definition (le within 1 or 2 years) will be
	Consider analysing changes over calendar time.

Project analysis plan – stage 5c: Attendance at specialist services for Hepatitis C and HIV

Background	See above.
Aims	Establish the pattern of ethnic differences in attendance at specialist services for those diagnosed with Hepatitis C and HIV in Scotland, and uptake of antiviral therapy for those attending services for Hepatitis C in Scotland
	Generate proportions and hazard ratios of attending specialist services within 1 year of original diagnosis when being diagnosed with Hepatitis C or HIV, in each ethnic group stratified by sex and adjusted for covariates (e.g age, socio-economic status, health board).
	Generate proportions and hazard ratios of initiation onto antiviral therapy within 1 year from attendance at specialist service for Hepatitis C, in each ethnic group stratified by sex and adjusted for covariates (e.g age, socio-economic status, health board).
	Repeat by country of birth instead of ethnicity.
Hypotheses	1. There are ethnic variations in attending specialist services, and uptake of antiviral therapy, when diagnosed with Hepatitis C and HIV. We hypothesise these vary between specific ethnic group and White Scottish.
	2. These variations cannot be explained by available covariates (e.g age, socio-economic status, health board).
	3. Similar hypothesis with COB
Data and ICD	Linkage census database, BBV databases and ACaDMe
codes	2 links distance to fam.
	2 INKED Datasets for :
Numerator	(a) People diagnosed who attended specialist services within 1 year
	of initial diagnosis
	(b) People diagnosed with chronic HCV who were initiated on
	antiviral therapy within 1 year of attendance
Denominator	(a) People diagnosed disease-positive (anytime) for a specific disease
	and linked to Census
	No age restriction (except for HIV, database confined to age >14)
	See further exclusions, under additional comments below.
	(b) People diagnosed with chronic HCV who attended specialist
	Censored for deaths and migrations
Tabulation	For each diagnosis: by sex and ethnicity

(1) Attendance at specialist services for HCV and HIV by ethnicity and sex

Analysis	1- By ethnicity:(a) Proportion of people who attended specialist services within 1 year of initial diagnosis
	 Poisson regression of number of cases (with confidence intervals and p-values) adjusted for age and other relevant covariates. Interaction will be considered if numbers allow. Goodness of fit statistics
	(b) Similar analysis to (a).
	Explore the effect of available covariates: age, socio-economic status, risk group, urban/rural indicator, NHS board
	2- By COB
	Same analysis as 1
Additional comments	For (a) Confine study populations to periods/health boards with comprehensive data on attendance at specialist services. And will need to do check/review cases where date of diagnosis equates to date of attendance. (Refer to McDonald S, et al. JVH) - Consider analysing changes over calendar time.

Project analysis plan – stage 6: Bowel Cancer Screening

(Bowel Cancer Screening data and Cancer Registry SMR06)

Background	Inequalities in uptake of bowel cancer screening by ethnicity were
	observed in pilots in England (UK colorectal cancer screening pilot)
	but there is no participant level comparable data in Scotland.
Aim	Establish pattern of ethnic differences in bowel cancer screening
	uptake and outcomes in Scotland.
	1. There are ethnic variations in screening uptake in men and
Hypotheses	women. We hypothesise these to vary in specific ethnic group
	compared to White Scottish.
	A lower uptake in minority ethnic group is expected (observed in
	South Asian population in England).
	2. These variations cannot be explained by available covariates
Data and ICD	Linkage database. Scottish Bowel Screening Programme and Cancer
codes	Registry (SMR06) database.
	ICD codes for cancer (ICD10). See Table 3 for list of codes.
Numerator	1- People screened
	2- Positive screening test results (SCRERES codes 3,5,6,8)
	3- Colonoscopy performed (completed and not)
	4- Pathology detected (polyps, adenoma, cancer (but not including
	polyp cancer))
	For first and second rounds of screening separately (screening data
	rounds in each Health Reard), where the size of the denominators
	allow
Denominator	Within the linked census population:
	1- People invited to screening
	2- People screened (participants)
	3- Positive screening test results
	4- Positive screening test results
	the addition in the last stand (second and the second stands the
	In addition- Pathology detected (cancer) will be analysed with
	denominators 1, 2 and 3 as well as people not screened (non-
	participants), participants with negative screening test
	Adjusted for deaths and migrations in the denominator
	populations.
Tabulation	For each outcome: Sex and ethnic group

	For screening uptake: By CoB [born in Scotland as the reference							
	group) and by religion (Church of Scotland as the ref group). By							
	pilot HB area or not.							
Analysis	For each screening round offered (by individual) separately:							
	- Screening uptake							
	 Positive screening test results rate 							
	 Positive predictive value (PPV) for cancer 							
	 Colonoscopy completion rate 							
	 pathology detected following colonoscopy (number of 							
	polyps, adenomas, crude cancer detection rate, Dukes'							
	stages A-D, site)							
	If time and numbers allow (likely to be small):							
	 False negative rates (screened, with negative test results 							
	but cancer is diagnosed before the next screening							
	invitation) and Negative Predictive Value (NPV)							
	- Number of cases							
	rates with standard adjustment for age							
	Poport rates or perceptages as appropriate							
	- Report rates of percentages as appropriate							
	r hepotic ethnic unreferences in risk ratio (roisson) with confidence							
	nopulation)							
	Adjust for age if necessary and appropriate covariates							
Adjust/stratify	Explore the effect of a range of available covariates (religion, country)							
	of hirth and socio-economic factors)							
Handling bias. c	hance and interaction - See bias notes							

Table 3: ID diagnostic groups and associated ICD codes for large bowel (colorectal) cancer (or non-invasive tumours)

ID Group	ICD-10 Codes
Malignant neoplasm of colon	C18.0-C18.9
Malignant neoplasm of rectosigmoid junction	C19X
Malignant neoplasm of rectum	C20X
Malignant neoplasm of anus and anal canal	C21.0-C21.8
Carcinoma in situ of colon	D01.0
Carcinoma in situ of rectosigmoid junction	D01.1
Carcinoma in situ of rectum	D01.2
Carcinoma in situ of anus and anal canal	D01.3
Neoplasm of uncertain or unknown behaviour of appendix	D37.3
Neoplasm of uncertain or unknown behaviour of colon	D37.4
Neoplasm of uncertain or unknown behaviour of rectum (or rectosigmoid junction)	D37.5

Primary analysis:

- Screening uptake
- Positive screening test results rate
- PPV for cancer

Secondary analysis:

- Colonoscopy completion rate
- pathology detected following colonoscopy (polyps, adenomas, crude cancer detection rate, Dukes' stages A-D, site)
- False negative rates and Negative Predictive Value

		Cancer	No Cancer	
FOB	Positive test	True Positive (TP)	False Positive (FP)	Positive Predictive
Screen				value = $TP/(TP+FP)$
Test	Negative test	False Negative (FN)	True Negative	Negative Predictive
outcome			(TN)	value = TN /
				(TN+FN)
		Sensitivity	Specificity	
		= TP / (TP+FN)	= TN / (FP+TN)	

Hypothesis ethnic specific:

Relative to Scottish reference population,

- Screening uptake will be same or higher in Other White British, similar in White Irish and lower in other White, in South Asian (SA) and non-white minority ethnic group.
- Positive predictive value (PPVs) will be lower in some minority ethnic group.
- Colon cancer less common in minority ethnic groups.

Diagram

Denominators

- People invited to screening
- People screened
- People invited but not screened
- Positive screening test results
- People with negative screening test



Numerators

- People screened
- Positive screening test results
 - Colonoscopy
- Pathology detected

Colonoscopy

Project analysis plan – stage 7: Primary Care risk factors

Background	We have previously explored ethnic variations in cardiovascular (CVD) outcomes in phase 2.
Aim	Explore whether previously shown ethnic variations in CVD outcomes (phase 2) in White Scottish, Other white British and Pakistani in Scotland change when adjusted for specified risk factors (i.e. smoking, diabetes).
Hypotheses	There are ethnic variations (eg between Pakistani men and Scottish men) in rates of CVD (all CVD, may possibly look at MI if numbers allow). These variations may change substantially (>10%) on adjustment for smoking, diabetes.
Data and ICD codes	Linked Census and Primary care databases (phase 3) further merged with: - CVD hospitalisations & deaths databases (phase 2)
Numerator	First CVD hospital discharge or death between May 2001 –April 2008 (phase 2 outcome)
Denominator	Linked 2001 census population to primary care records (around 53,000 people) - Restricted to people aged 30 years old and above PY at risk
Tabulation	Sex and ethnic group
Analysis	 For first CVD event: <u>Definition of risk factors:</u> Smoking status: identify "Never smoker" recorded anytime and set as default, update as "Ever smoker" if any "smoker" or "ex-smoker" status is recorded up to April 2008. Diabetes: any diabetes (excluding gestational) recorded prior to April 2008. 1. Cross tabulation of primary care risk factors (complete linked database) with Ethnicity 2. Assess data completeness in relation to CVD (complete linked
	database)

7a- CVD outcomes

	 What proportion of patients with both health outcome (any first CVD event) and a primary care record has a record of diabetes by ethnic group? What proportion of patients with both health outcome (any first CVD event) and a primary care record has a record of smoking status (ever, never, not known) by ethnic group? 		
	3. Explaining ethnic variation in outcomes using risk factor data - Are ethnic variations in outcomes (CVD risks) altered on adjustment for risk factors (i.e. smoking, diabetes)? Use count regression method (negative binomial or Poisson if data confirmed as having no extra-Poisson variation) to examine unadjusted estimates (CVD incidence risks) by ethnic group with those adjusted for risk factors.		
Adjust/stratify	Explore the effect of available covariates such as socio-economic		
	factors (include education in the model as for CVD analyses in phase 2)		
Handling bias, chance and interaction - See bias notes			

Table 5: Read codes used to define Diabetes and Smoking risk factors

4.a. Diabetes

All the read codes starting with C10 were requested for extraction. They are included in the definition of Diabetes excluding C10K (Type A insulin resistance), C10L (Fibrocalculous pancreatopathy) and C10FS (Maternally inherited diabetes mellitus). No other code related to gestational diabetes (e.g. L1808, 8CE00, Q44B) is included nor was requested for extraction.

4.b. Smoking status

All the read codes starting with 137 were extracted. Smoking status includes all 137 codes as classified in the table below:

Read Code	Title	Classified as				
1371	Never smoked tobacco Never smok					
1372	Trivial smoker - < 1 cig/day Smoker					
1373	Light smoker 1-9 cigs/day Smoker					
1374	Moderate smoker 10/19 cigs/day	Smoker				
1375	Heavy smoker 20-39 cigs/day	Smoker				
1376	Very heavy smoker 40+ cigs/day	Smoker				
1377	Ex-Trivial smoker - < 1 cig/day	Ex-smoker				
1378	Ex-Light smoker 1-9 cigs/day	Ex-smoker				
1379	Ex-Moderate smoker 10/19 cigs/day	Ex-smoker				
137A	Ex-Heavy smoker 20-39 cigs/day	Ex-smoker				
137B	Ex-Very heavy smoker 40+ cigs/day	Ex-smoker				
137C	Keeps trying to stop smoking	Smoker				
137D	Admitted tobacco cons untrue?	NC*				
137E	Tobacco consumption unknown	NC*				
137F	Ex-smoker - amount unknown	Ex-smoker				
137G	Trying to give up smoking	Smoker				
137H	Pipe Smoker Smoker					
1371	Passive smoker NC*					
13710	Exposed to tobacco smoke at home NC*					
137J	Cigar smoker	Smoker				
137K	Stopped smoking	Ex-smoker				
137L	Current non-smoker	Never smoker				
137M	Rolls own cigarettes	Smoker				
137N	Ex-pipe smoker	Ex-smoker				
1370	Ex-cigar smoker	Ex-smoker				
137P	Cigarette Smoker	Smoker				
137Q	Smoking started	Smoker				
137R	Current smoker	Smoker				
137S	Ex smoker	Ex-smoker				

137T	Date ceased smoking	Ex-smoker
137U	Not a passive smoker	NC*
137V	Smoking reduced	Smoker
137W	Chews tobacco	NC*
137X	Cigarette consumption	Smoker
137Y	Cigar consumption	Smoker
137Z	Tobacco consumption NOS	Smoker
137a	Pipe tobacco consumption	Smoker
137b	Ready to stop smoking	Smoker
137c	Thinking about stopping smoking	Smoker
137d	Not interested in stopping smoking	Smoker
137e	Smoking restarted	Smoker
137f	Reason for restarting smoking	Smoker
137g	Cigarette pack-years	Smoker
137h	Minutes from waking to first tobacco consumption	Smoker
137i	Ex-tobacco chewer	NC*
137j	Ex-cigarette smoker	Ex-smoker
137k	Refusal to give up smoking status	NC*
1371	Ex-roll up cigarette smoker	Ex-smoker
137m	Failed attempt to stop smoking	Smoker
137n	Total time smoked	Smoker
1370	Waterpipe tobacco consumption	NC*

* NC = Not classified

7b- All-cause mortality

Background	We are exploring ethnic variations in all-cause mortality in phase
	4.
Aim	Explore whether ethnic variations in all-cause mortality (phase 4) in White Scottish, Other White British and Pakistani in Scotland change when adjusted for specified risk factors (i.e. smoking, diabetes).
Hypotheses	There are ethnic variations in all-cause mortality rates. These variations may change substantially (>10%) on adjustment for smoking and diabetes.
Data and ICD codes	Linked Census and Primary care databases (phase 3) further merged with:
Numerator	- All-cause Mortality database (pliase 4)
Numerator	Death between May 2001 – April 2015 (phase 4 outcome)
Denominator	Linked 2001 census population to primary care records (around 53,000 people) PY at risk
Tabulation	Sex and ethnic group
Analysis	For all-cause mortality:
	 <u>Definition of risk factors:</u> Smoking status: identify "Never smoker" recorded anytime and set as default, update as "Ever smoker" if any "smoker" or "ex-smoker" status is recorded up to April 2013. Diabetes: any diabetes (excluding gestational) recorded prior to April 2013. 1. Cross tabulation of primary care risk factors (complete linked database) with Ethnicity.
	 with Ethnicity 3. Explaining ethnic variation in outcomes using risk factor data Are ethnic variations in outcomes (all-cause mortality rates) altered on adjustment for risk factors (i.e. smoking, diabetes)? Use count regression method (negative binomial or Poisson if data confirmed as having no extra-Poisson variation) to examine unadjusted estimates (all-cause mortality risks) by ethnic group with those adjusted for risk factors.
Adjust/stratify	Explore the effect of available covariates such as socio-economic factors

Handling bias, chance and interaction - See bias notes

Appendix one

Template for output tables for RR

Male											
				Age-adjusted RRs				RRs adjusted for age + other variables			
	N event	PY at risk	Poisson rates (for 100,000 PY)	RR	lower Cl	upper Cl	р	RR	lower Cl	upper Cl	р
White Scottish				100				100			
Other White British											
White Irish											
Other White											
Ethnic 5											
Ethnic 6											
Ethnic 7											
Other covariate 1											
Other covariate 2											

Female

			Age-adjusted RRs			RRs ad	justed for a	ge + other v	ariables		
	N event	PY at risk	Poisson rates (for 100,000 PY)	RR	lower Cl	upper Cl	р	RR	lower Cl	upper Cl	р
White Scottish				100				100			
Other White British											
White Irish											
Other White											
Ethnic 5											
Ethnic 6											
Ethnic 7											
Other covariate 1											
Other covariate 2											

Appendix two

Statistical Disclosure Control Guidance for the Scottish Health and Ethnicity Linkage Study

(Draft revised version July 2014)

These guidelines apply disclosure control principles to outputs from the SHELS data. More general guidance can be obtained from the ESSNet document on SDC on microdata research.¹

1. Numbers of persons

1.1 Sub-group sizes and statistics

Many outputs report the number of persons (N) who fall into a given category such as a cell in a frequency table or matrix. The guideline is that if N is 5 or below, it is deleted and replaced by a full stop. If N is 6 or above, its disclosure-controlled value (from now on referred to as its controlled value) is reported. Where N has the value 6 or 7, its controlled value is 10; otherwise its controlled values for original values of N from 0 to 17 and the general rule for k > 3:

Table 1: Original and controlled values					
Original N	0 to 5	6 to 12	13 to 17	(5k - 2) to (5k + 2)	
Controlled N		10	15	5k	

Any statistics (such as means, risk ratios and confidence intervals) are reported unless N is 5 or below in which case they are also replaced by full stops as per the following table:

Table 2: Publication protocol				
$0 \le N \le 5$ Replace both N and any statistics by full stops				
N = 6 or 7	Replace N by 10 and report statistics			
N ≥ 8	Replace N by the nearest multiple of 5 and report statistics			

1.2 Marginal totals

¹ Brandt M., Franconi L., Guerke C., Hundepool A., Lucarelli M., Mol J., Ritchie F., Seri G. and Welpton R. (2010), *Guidelines for the checking of output based on microdata research*, Final report of ESSnet sub-group on output SDC. Available at http://securedata.data-archive.ac.uk/media/11679/essnet_sdc.pdf

It is assumed that row and column totals are either reported as part of the table or that they can be calculated from outputs published elsewhere from the same data set. To achieve this while maintaining disclosure, marginal totals of rows, columns and tables will be subject to the same disclosure control as individual cell values.²

Cell values and marginal totals expressed as percentages will not be released, though controlled values can after their release be expressed as percentages by the researchers.

1.3 Disclosure between tables

If a statistic is suppressed in one table it must not be derivable by comparing data released in any other table or in any other previously released tables. The use of rounded values for publication means that such comparisons cannot be made to the necessary level of precision and hence disclosure checking between tables is not required.

2. Graphical output

- 2.1 Histograms and bar charts (whether simple or stacked) can be reported if, and only if, the same data in frequency table form could be reported. Columns corresponding to cells of fewer than six cases must be deleted.
- 2.2 In general, graphical output can be used only to make released (or releasable) tabular or other formats more accessible to the user. Hence scatterplots for example are not permitted if they allow the identification of groups of fewer than six persons as this would not be released.

3. Derived statistics

- 3.1 Correlation coefficients can be reported if they are based on at least four degrees of freedom (corresponding to at least six persons).
- 3.2 Values of test statistics where the number of degrees of freedom is based on the number of microdata records³ can be reported where the number of degrees of freedom represents at least six persons.

² The controlled marginal totals will often not equal the sums of the controlled cell values of which they are composed. Overall however the controlled values will remain as close to the original data as possible while maintaining disclosure control.

³ This is to prevent reporting of test statistics with few degrees of freedom where this indicates few microdata records. It does not for example cover the chi-square test for independence in a contingency table. This could be disclosed since the number of degrees of freedom depends on the number of cells in the table, not on the numbers of observations in those cells, and it is the latter which are determined by the numbers of microdata records.

Appendix three

Guidelines on the Destruction and Retention of Output

The SHELS project involved the analysis of a linked data set part of which was taken from results of the 2001 Census and as such it is covered by the legislation governing the use and management of Census data. These guidelines are consistent with that legislation and with Scottish Government practice on data management to ensure that the security of person-level data is secure and is seen to be secure by all parties.

This document concerns the destruction of "output" or "release requests" (i.e. the results of the statistical analysis undertaken by the SHELS researchers). This must be distinguished from the destruction of the data sets themselves which are held in the secure setting at Ladywell House. These will in due course be destroyed after the end of the SHELS project, but this matter is dealt with elsewhere.

Output usually consists of word processor files, spreadsheets and paper hard copy which have been considered and approved by the Disclosure Committee. They can be divided into (i) those which are going into the public domain such as a journal or seminar presentation and (ii) those which are for circulation only within the team of researchers who have signed the confidentiality undertaking. No restrictions apply to anything in the first category. The documents which will be published can be stored and disseminated in any way and no document destruction criteria apply.

Output restricted to the team of researchers will be marked with a heading stating this when it is released from National Records of Scotland. After the researchers have completed their consideration of the output and the analysis to be used has been decided and implemented, all output not intended for publication must be destroyed with the exception of material held in case of post-publication queries. Material in this latter category must be packaged appropriately and transferred to the secure setting in Ladywell House where it will be stored for five years or until the end of the SHELS project.

The destruction of material not to be published or retained should follow the guidance below. After it has been destroyed, confirmation of this should be forwarded to the Principal Investigator using the form on the reverse of this sheet.

Emails:

Delete the emails from Inbox and then from the backup storage. Word processing and spreadsheet files on hard drives or USB sticks/drives:

Send to Recycle Bin, Wastepaper Basket or equivalent and then empty the Recycle Bin or Wastepaper Basket.

Paper Destructive Procedures:

Destroy using commercially available equipment that meets BS EN 15713:2009. A cross cutting shredder with a cutting width of 4mm or less (BS EN15713: 2009 shred number 6) is recommended. OR:

Destroy by disintegration using a SEAP 8100 approved disintegrator with a mesh size of 6mm or less. OR:

Destroy by incineration using a SEAP 8100 incinerator or a SEAP 8200 approved organisation.

Compact Discs (CDs) Destructive Procedures:

Break/cut the disc into two or more pieces, ensuring that no piece is greater than 50% of the total disc area.

Output Destruction Form

Project: Scottish Health and Ethnicity Linkage Study (SHELS)

Principal Investigator: Prof. Raj Bhopal, University of Edinburgh Form completed by :

Please clearly indicate your answers by marking ' \checkmark ' in the blank boxes.

Project topic: Ethnic variations in chest pain and angina in men and women				
Type of output	Method used	Output destroyed	Reason (if not destroyed)	
E-mails	(e.g. deleted from inbox and from backup)			
Word files and spreadsheets	(e.g. deleted from directory and from recycle bin)			
Hard copy paper drafts	(e.g. shredded)			
Manuals				
Letters				
CDs and DVDs	(e.g. cut into two)			

Mention any other source destroyed.

Type of output	Method used	Output destroyed	Reason
			(if not destroyed)

Please sign and forward (a paper or scan copy) of the checklist to Prof. Raj Bhopal, Principal Investigator, SHELS Project.

Destroyed by: (Name in Capitals) Signature:

Full Address:

Date:

E-mail id: Phone no.:

Appendix four

Content of census and health related data

Contents of the Census data

Fields: Ethnic group Religion, current Religion of upbringing Country of birth Age Sex Long term illness Self assessed health Marital status Labour force status Socioeconomic status **Highest qualification** Scottish Index of Multiple Deprivation deciles Car ownership Housing tenure Household size Number of rooms Urban/rural indicator Health board (Glasgow, Lothian, Tayside, Other) Mobile (temporary) accommodation Self-contained accommodation Central heating Moved within last year Economic activity last week Occupation – will be requested from NRS either as a variable based on Standard Industrial Classification or a calculated variable for Occupational risk factor group

Contents of Health Related Data for NRS deaths records (all cause mortality)

Fields:

Encrypted CHI* Date of death Primary and secondary causes of death

*NB. Encrypted CHI is only used by ISD staff to link the health and Census data and is then removed from the analyses files that are used by the SHELS research team.

Contents of Health Related Data for SMR01/Deaths – All Cause Hospitalisations

Fields:

Encrypted CHI* Age in years Sex Admission date Admission type Admission reason Duration of hospital admission Days waiting Main condition (for readmission analysis per disease) Date of discharge Discharge type Date of death Causes of death - primary and secondary

NB: Calculated fields such as length of stay and episode markers will be added to the extracted dataset by ISD linkage team

Contents of Health Related Data for SMR01/Deaths for Injuries and Poisoning and all Infectious Diseases

Fields: Encrypted CHI Age in years Sex Admission date Admission type Admission reason Duration of hospital admission Main condition (all ICD 9&10 codes for infectious diseases; injuries/poisoning codes) Other condition (all ICD 9&10 codes for infectious diseases; injuries/poisoning codes) Date of discharge Discharge type Date of operation Operation code Inpatient/day case marker Date of death Causes of death - primary and secondary (all death following hospitalisation as well as disease-specific death)

NB: Calculated fields such as length of stay and episode markers will be added to the extracted datasets by ISD linkage team

Contents of Health Related Data for HPS databases: (The HepB, HepC and HIV datasets at HPS cover different time periods and do not all contain the same data variables, due to the differing epidemiology and clinical management of each disease).

Hepatitis B/SMR01/Deaths

Fields:
Encrypted CHI
Sex
Age at diagnosis (years)
NHS Board of residence (at diagnosis)
Date of earliest HBsAg positive specimen (MMYYYY)
Source of 1 st positive test (hospital, routine/antenatal screen, GP, other community
setting)
HBV test result (recent/acute, chronic)
Ethnicity assigned from Onomap (incomplete)
Date of late diagnosis (MMYYYY)
Late diagnosis indicator
Date of migration (MMYYYY)
Date of death (MMYYYY)

NB: Ethnicity from the HPS data (where available) will be used to check validity of current reports for the Scottish Government by comparing to similar tables using self-assigned ethnicity from the 2001 Census.

Contents of Health Related Data for HPS databases: Hepatitis C/SMR01/Deaths

Fields:

Encrypted CHI Sex Age at diagnosis (years) NHS Board of residence (at diagnosis) Date of earliest positive specimen (MMYYYY) Source of 1st positive HCV test (hospital, routine screen, GP, other community setting) HCV test result (recent/acute, chronic, resolved) Description of result HCV genotype **Risk group** Date of first attendance (specialist services) (MMYYYY) Time from diagnosis to 1st attendance (specialist services) (day) Date started antiviral therapy (MMYYY) Time from diagnosis to start of antiviral therapy (day) Response to antiviral therapy (sustained viral response (SVR), non-SVR) Late diagnosis date (MMYYYY) Late diagnosis indicator Date of death (MMYYY) Date of migration (MMYYYY)

NB. Country of Birth in the HepC database is very incomplete, ethnicity is not available, hence not included in this dataset.

Contents of Health Related Data for HPS databases: HIV Diagnoses/SMR01/Deaths

Fields:

Encrypted CHI Sex Age at diagnosis (year) NHS Board of residence (at diagnosis) Date of earliest positive specimen (MMYYY) Source of HIV diagnosis (hospital, routine screen, GP, other community setting) Risk group Country of birth (incomplete prior to 2007) Ethnicity (incomplete) Date of AIDS diagnosis (symptoms) (MMYYYY) New case (Known in Scotland or elsewhere/New to Scotland/Unknown) Infected outside to Scotland (Yes/No) Follow up status (Attending/Not attending/Lost/Dead/Left Scotland/Recent) Date last attended healthcare services Date of 1st attendance in HIV specialist care (MMYYYY) Time from diagnosis to 1st attendance in HIV specialist care (day) Date of 1st attendance for CD4 measurement (MMYYYY) Time from diagnosis to 1st attendance for CD4 measurement (day) 1st CD4 result (category: low, medium, high) Date of late diagnosis (MM YYYY) Late diagnosis indicator Date of death (MMYYYY) Date of migration (MMYYYY)

NB: Country of birth/Ethnicity from the HPS data (where available) will be used to check validity of current reports for the Scottish Government by comparing to similar tables using self-assigned ethnicity from the 2001 Census.

Contents of Health Related Data for Scottish Bowel Cancer Screening Program

Fields:

Encrypted CHI Date screening test kit sent to participant Health Board of Residence Screening round Sex Age in years Screening test result Flag for kit completed in error Health Board identifier/code Date of notification of a screening result Colonoscopy performed Date colonoscopy performed Reason for not having a colonoscopy Colonoscopy completed Invasive cancer detected ICD-10 classification of neoplasm Tumour classification (after surgery) Nodal classification (after surgery) Metastases classification (after surgery) TNM derived Dukes' stage Polyps detected Adenoma detected Count of adenomas Maximum dimension of the largest adenoma Polyp cancer detected Polypectomy performed at colonoscopy Complication from the colonoscopy requiring admission Death

Contents of Health Related Data for SMR06 (Cancer Registry) for linking to Bowel Cancer Screening dataset

Fields: Encrypted CHI Date of incidence/Incidence date

Site ICD9 ICD10 Cancer site ICDO2 Type ICD 03 Grade cell type Stage colorectal

Contents of Health Related Data for Primary Care Risk Factor Data

(from SHELS phase 3 covered by ethical approval reference 11/MRE00/4)

Full Field name	English description	
Encrypted CHI		
Date of registration	First date of patient registration in practice	
Date of deregistration	Date of last deregistration or death	
Tobacco consumption	All recording of smoking codes	
Tobacco consumption Date	Date/time variable	
Family history of disease	All recordings of family history of disease	
Family history of disease date	Date/time variable	
Exercise	All recording of exercise status	
Exercise Date	Date/time variable	
Diabetes	All diagnoses of diabetes	
Diabetes Date	Date/time variable	
CHD	All diagnoses of Coronary Heart Disease	
CHD Date	Date/time variable	
Stroke	All diagnoses of Stroke & Transient Ischaemic	
Stroke Date	Date/time variable	
Atrial Fibrillation	All diagnoses of Atrial fibrillation	
AF Date	Date/time variable	
Statins	All prescriptions of Lipid lowering therapies	
Statins Date	Date/time variable	
Height	All values or measurements	
Height date	Date/time variable	
Weight	All values or measurements	
Weight date	Date/time variable	
Cholesterol	All values or measurements	
Cholesterol Date	Date/time variable	
Systolic_blood_pressure	All values or measurements	
Systolic_blood_pressureDate	Date/time variable	
Diastolic_blood_pressure	All values or measurements	
Diastolic_blood_pressureDate	Date/time variable	
Asthma	All diagnosis of asthma	
Asthma date	Date/time variable	
Asthma prescriptions	All prescriptions of inhaled corticosteroids	
Asthma prescriptions date	Date/time variable	
Appendix five

Recommended terminology for use in papers

Reasons for multiplying RRs by 100 Results should be labelled rate or risk ratios	Results are then percentages and it is easier for interpretation by readers of papers as fewer decimal points are used. Rate ratios are when incidence
	rates are calculated using the person time denominator. Risk ratios are the outcome of incidence rates calculated using the population denominator (also known as the cumulative incidence rate or, synonymously, cumulative incidence proportion).
	If the ratios relate to prevalence data, and not incidence data, the correct phrase is prevalence ratio, or synonymously, prevalence rate ratio or prevalence proportion ratio-the latter being, strictly, the correct phrase)
	For analysis using proportions eg readmissions and bowel cancer screening outcomes, results should be labelled risk ratios.