HPS Weekly Report

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NHS National Services Scotland

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51/0201 The weekly national influenza report (for week ending 8 January 2017 – available at http://www.hps.scot.nhs.uk/resp/seasonalinfluenza.aspx?subjectid=00) notes that, in Scotland, clinical influenza activity in primary care is stable and remains low. However clinical activity in secondary care is increasing. Virological influenza activity suggests that there is evidence of increasing community circulation of influenza.

The levels of most winter respiratory pathogens reported through non-sentinel sources (ECOSS) and sentinel sources were within expected seasonal levels for the last week with the exception of coronavirus and adenovirus which exceeded seasonal levels in non-sentinel and sentinel sources respectively.

Current respiratory syncytial virus (RSV) detection levels in non-sentinel and sentinel sources suggest that the annual RSV wave has peaked and is decreasing.

A CMO letter, recommending that antiviral drugs can now be prescribed for the prevention or treatment of influenza in the community where clinically indicated, was issued on 23 December 2016 and can be accessed at http://www.hps.scot.nhs.uk/resp/seasonalinfluenza.aspx?subjectid=00#antivirals.

FSS/FSA warning on frozen meat and fish products

51/0202 On 13 January, Food Standards Scotland (FSS) and the Food Standards Agency (FSA) issued a warning to consumers not to eat a number of food products, mainly frozen fish and chicken, supplied by MDA Products Ltd. The products had been repackaged in unapproved premises and were therefore judged to be potentially unsafe.

The products are also the subject of a number of labelling and traceability contraventions. They may have ‘best before’ or ‘use by’ dates that have been extended beyond those set by the

Health Protection Scotland

manufacturers and without authorisation. They are not compliant with food law requirements and should be withdrawn from the market and recalled from consumers.

Despite investigations by the enforcement authorities, it has not been possible to obtain the full distribution details or product traceability record for these products. Details of known distribution to three retail chains are provided in an attached alert to local authorities. [Source: FSA Food Alert, 13 January 2017. https://www.food.gov.uk/news-updates/news/2017/15879/consumers-warned-about-frozen-meat-and-fish-products-mda-products-ltd]

Environmental incidents - SEISS reports (Gardenstown – farm fire)

51/0204 The Scottish Environmental Incident Surveillance System (SEISS) recorded the following incident in the past week:

- Around 60 firefighters tackled a major blaze at a farm in Aberdeenshire. The Scottish Fire and Rescue Service (SFRS) said crews were sent to the scene at Palace Farm near Gardenstown at about 11:15 on 9 January. Among several units dispatched was a specialist hazardous materials team from Aberdeen. The fire service said asbestos sheeting in the roof of the building was alight (http://www.bbc.co.uk/news/uk-scotland-north-east-orkney-shetland-38558591).

For more detailed information on SEISS, go to http://www.hps.scot.nhs.uk/enviro/ssdetail.aspx?id=107 or contact either Ian Henton or Colin Ramsay at HPS on 0141 300 1100.

Hepatitis B infection in Scotland: 2015

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Key points

- It is estimated that there were in total 4966 individuals diagnosed and living with chronic HBV infection at the end of December 2015.
- The annual number of chronic HBV diagnoses is stable with an average of 369 diagnoses per year between 2011 and 2015.
- Those of non-British ethnicity comprise the majority (73%) of the diagnosed chronically infected HBV cohort.
- There are more male than female chronic HBV infections (ratio 1.5:1) with the majority aged 25-44 years.
- Acute infection diagnoses have reduced in recent years to 25 and 18 diagnoses, respectively, in 2014 and 2015 compared to an estimated 50 diagnoses in 2011; this reduction is likely to be due, in part, to the success of the vaccination policy.
- HDV infection is rare.
- A high proportion (95%) of those eligible are receiving treatment and care with 91% experiencing an optimal treatment response.
- There is evidence that some individuals are being diagnosed with HBV at the stage of advanced liver disease.

Background

Hepatitis B is a bloodborne infection caused by the hepatitis B virus (HBV). This is a hepatotropic virus, first discovered and described in Australia in 1965 by Nobel prize winner Dr Baruch Blumberg.[1] An estimated 240 million people are chronically infected worldwide and over 686000 die each year from sequelae of infection, including cirrhosis and hepatocellular carcinoma.[2]

Transmission of HBV is via parenteral exposure to infected blood or body fluids most often through sexual transmission, blood-to-blood contact and perinatally from mother to child at birth. It is a vaccine preventable infection and, in the UK, vaccination is recommended for groups of individuals who are at the highest risk of exposure to the virus, for example, healthcare workers, people who inject drugs (PWID), and household contacts of those chronically infected with hepatitis B.[3]

The virus can cause both acute and chronic infection. Acute infection is characterised by symptoms such as general malaise, fatigue, nausea and jaundice although many people are asymptomatic during the acute phase. Most adults (>95%) will clear the infection. In contrast, however, a high proportion of babies (90%) and children <6 years (30-50%) will develop chronic infection. Individuals with chronic infection have an increased risk of developing liver cirrhosis and hepatocellular cancer (HCC), which is estimated to occur in about 30% of chronically infected adults. While treatment is not curative, it can suppress the replication of the virus and, therefore, reduce the infectivity of the individual.

Testing for hepatitis B infection - that is the detection of hepatitis B surface antigen (HBsAg) and a range of other viral markers - has been available since the early 1970s. In the UK, HBV testing has been incorporated into two population-based screening programmes, that of the blood donor population and also women attending antenatal services. Scotland is considered to be a low prevalence country, with an estimated 0.2% of the Scottish population chronically infected with HBV.[4]

As part of the implementation of the Scottish Government's Sexual Health and Blood Borne Virus Framework in 2011,[5] HPS sought to improve surveillance of hepatitis B infection and its outcomes in association with the HBV testing laboratories and viral hepatitis clinicians. This report brings together, for the first time, data from a number of sources to describe the epidemiology of hepatitis B in Scotland with the aim of providing timely information for microbiologists, clinicians, consultants in public health medicine, policy makers, and others involved in the field of hepatitis B infection.

Methods

There are several sources of data used in this report:

i. laboratory data with information on both testing and positive HBV diagnoses;

ii. data on acute HBV using an enhanced surveillance form to collect information from the NHS board health protection teams;

iii. laboratory data on hepatitis D virus (HDV) testing from the BBV specialist testing laboratories;

iv. survey data on the uptake of HBV vaccine among babies who are eligible to receive it.[3] This information is collected from the NHS board health protection teams;

v. survey data from the Needle Exchange Surveillance Initiative (NESI) on vaccine uptake among people who inject drugs (PWID); and,

vi. survey data on estimates of those who are diagnosed and living with chronic HBV who are attending specialist treatment services and, of those eligible, the number receiving antiviral treatment. This information is collected from the clinics with the support of the viral hepatitis lead clinicians.

The laboratory data on HBV testing (both positive diagnoses and negative results) are collated at HPS. The testing database was originally created using extracts of data, from 1998 to 2013, provided by the four principal HBV testing laboratories in Scotland, based in NHS Greater Glasgow and Clyde, NHS Lothian, NHS Tayside, and NHS Grampian, where most of the confirmatory serological HBV testing is performed. The data were extensively cleaned and tests related to the same individuals were found using the Community Health Index (CHI) number where available and combinations of other key patient identifiers where the CHI number was not available.[4] Since 2014, the database has included testing data sent by laboratories in NHS Ayrshire and Arran, NHS Borders, NHS Fife and NHS Highland via the Electronic Communication of Surveillance Scotland system (ECOSS: http://www.hps.scot.nhs.uk/surveillance/SystemsDetail.aspx?id=248). For this reason, data presented on HBV testing for 2014 and 2015 are not directly comparable to those in previous years.

The data collected on all diagnoses include soundex code of surname (full identifiers are not held so that patient confidentiality is maintained); date of birth; gender; date of earliest positive specimen; source of specimen; area of residence; and risk information. The amount and accuracy of the risk information is limited to what is available on the test request forms which accompany the specimens for hepatitis B testing – this information is not used in this report as limited information is provided for a small number of samples.

Prior to the replacement of the surname with a soundex code, Onomap software (http://www.onomap.org/) is used to assign ethnicity to each individual. This software programme has variable sensitivity[6] in assigning names to specific non-British sub-categories of ethnicity. Therefore, for the purposes of this report, individuals are simply assigned to British or non-British ethnicity.

Following linkage of the hepatitis B data to the CHI database, individuals are assigned to a deprivation quintile using the Scottish Index of Multiple Deprivation (SIMD). This SIMD quintile relates to an individual's latest known residence according to the CHI database at the time of the linkage. The data on those tested and diagnosed positive are discussed using both ethnicity and SIMD profiles from these analyses. The data are also analysed by source of test request and these data are presented for 2015, with some further commentary on those being tested via the antenatal screening programme which commenced in Scotland in 2003.

On exclusion of those with probable acute infection, and those who have died (information generated from linkage to the General Register of Scotland (GROS) database of deaths), a database of those chronically infected with HBV, defined as being HBsAg positive for more than six months, is available for these analyses. These data are presented in this report.

The enhanced surveillance of acute infection employs a survey form which is used to collect details of individuals with probable acute infection. This is completed by the NHS board health protection teams.

Vaccine uptake surveys: A survey form is used to record the number of babies who have received three doses of HBV vaccine within their first year and four doses by their second birthday. This form is completed by the NHS board health protection teams. This survey was developed to address one of the Outcome 1 HBV indicators of the Sexual Health and Blood Borne Virus (SHBBV) framework.[5] The NESI surveillance form includes questions on the uptake of HBV vaccine doses and where these doses were given, for example in the prison setting (http://www.uws.ac.uk/research/research-institutes/social-sciences/health-behaviours-and-policy/needle-exchange-surveillance-initiative/).

Treatment survey: A survey form is used to collate data on those attending for HBV treatment and care at all the clinical centres in Scotland (six infectious disease and nine hepatology/gastroenterology units). This survey was developed to address one of the Outcome 3 HBV indicators of the SHBBV framework.[5] Clinicians are asked to estimate the number attending, the number on treatment according to the European Association for the Study of the Liver (EASL)[7] or the National Institute for Health and Care Excellence (NICE) guidelines[8] and those with an optimal treatment response according to the criteria in the guidelines.

Hepatitis B testing: 2015

The algorithm for HBV testing of markers of infection varies according to the setting where the patient attends. In most settings, for example hospital and primary care, a HBsAg test is used as the first line diagnostic test for HBV among patients who may have been at risk and/or asymptomatic or symptomatic to include or exclude HBV infection as part of clinical investigations. However, in settings such as sexual and reproductive health (SRH) clinics, a hepatitis B core antibody (HBcAb) test is commonly used as the first line test as many individuals are tested for evidence of previous infection as they may be considered for vaccination according to the UK guidelines.[3]

To examine HBV testing in Scotland, HBsAg tests from all settings, except SRH clinics, were considered; in SRH clinics, both HBsAg and HBcAb tests were considered. Excluding tests conducted in routine clinical settings and as part of screening programmes (for example, antenatal, renal and

occupational health screening tests), 70735 individuals received at least one HBsAg test in 2015 (or if first tested in an SRH clinic, at least one HBsAg or one HBcAb test). Of those tested, 457 (0.6%) individuals tested positive.

Figure 1 illustrates the settings where individuals had their first HBV test in 2015 together with the settings where individuals first tested positive. The majority of tests were requested from hospitals (28166; 40%), primary care (25589; 36%) and SRH clinics (8419; 12%). The highest proportions of positive HBsAg tests were observed in the 'not known' category (46/1931, 2.4%) and in the 'other' setting (28/1788, 1.6%). The 'not known' category are those tests which cannot be mapped to a defined clinical setting with the information available at this time, while 'other' settings may include testing in counselling clinics and family planning settings but may also include some unmapped occupational or routine screens. It is hoped that the data quality on source of test requests can be improved in future reports.

Over half of all testing was performed on men (52%, Table 1) and the proportion positive was also higher in this group, with 0.8% of men, compared to 0.5% of women having a positive HBsAg test in 2015. Most individuals tested were aged 25-34 (17693, 25%) or 35-44 (12863, 18%) and the proportion of tests which were positive was also highest in these groups (1.0% and 0.8%, respectively). Furthermore, the median age of those tested was 39 years (Inter Quartile Range, IQR 28-55 years) and this was similar among those testing positive (median 34; IQR 27-44 years).

It was possible to derive ethnicity using name classification software for most of the individuals tested (62496, 88%). Those with unknown ethnicity (8239) were assumed to be non-British. Over three-quarters (54868, 78%) of individuals tested were classified as being of British ethnicity. However, non-British individuals tested positive for HBsAg much more frequently (2.2%) than British individuals (0.2%).

There was more testing among individuals living in more deprived areas of Scotland and positivity was highest for those living in areas belonging to the most deprived SIMD quintile (166/18019, 0.9% in SIMD quintile 1); the proportion of positive tests in the other deprivation quintiles was similar (range 0.3% to 0.6%). In total, 14% (10056) of tests related to individuals who could not be linked to the deprivation data due to a lack of identifiers.

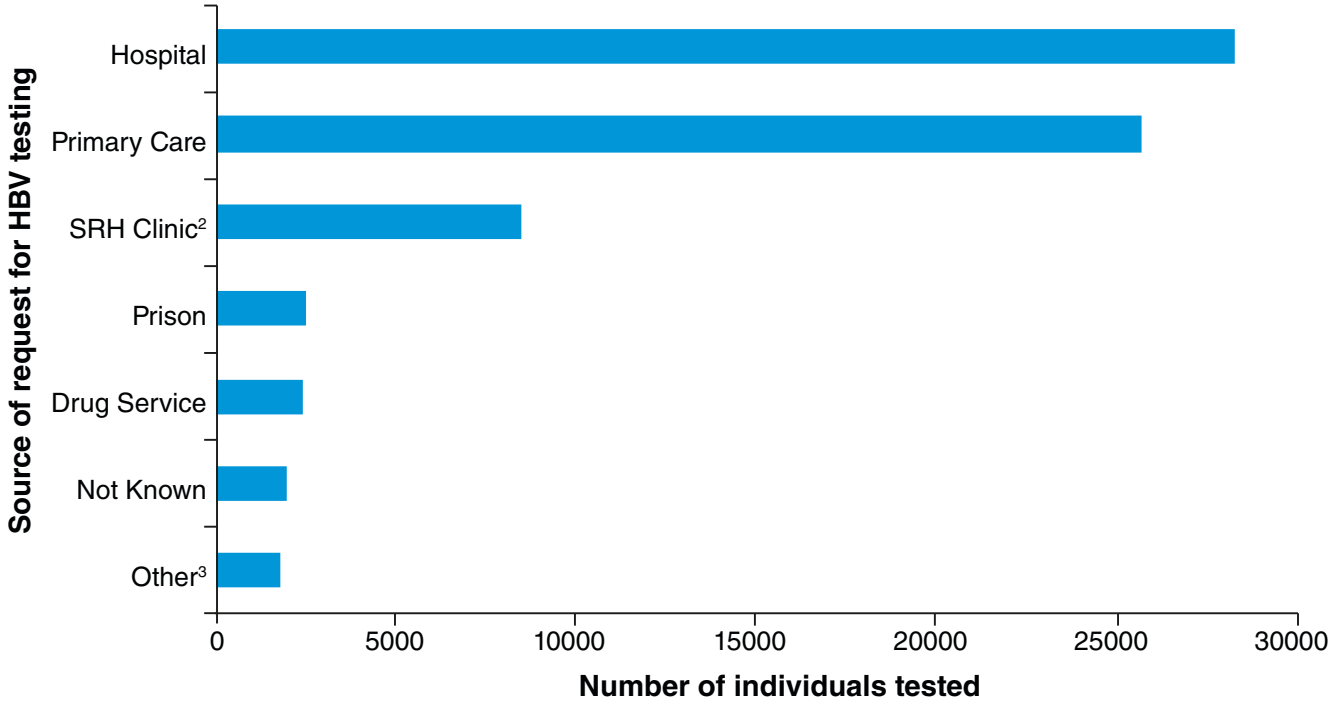
Acute hepatitis B infection

A system for gathering epidemiological information on acute hepatitis B in Scotland was implemented in July 2015 using a new enhanced surveillance form. Data for 2014 and 2015 were collected from the health protection teams in the NHS boards. Previous estimates of acute infection were based on an algorithm for extracting data from the laboratory diagnoses dataset which contains no risk or similar information. The new system allows for a fuller description of the epidemiology of acute hepatitis B in Scotland.

In 2014 and 2015, 25 and 18 diagnoses of acute HBV were reported, respectively, from nine NHS boards. This may include some diagnoses for whom reactivation of chronic infection could not be excluded. There were more diagnoses of acute infection among men (31) than among women (9) giving a 3.5:1 ratio. Overall, the ages ranged from 18 to 83 years with a median age of 38 years among women and 43 years in men.

For those individuals whose route of transmission was identified (29), sexual transmission was the most common risk factor (24, 83%) during 2014 and 2015. The majority (13) were via heterosexual contact and nine were among men who have sex with men (MSM).

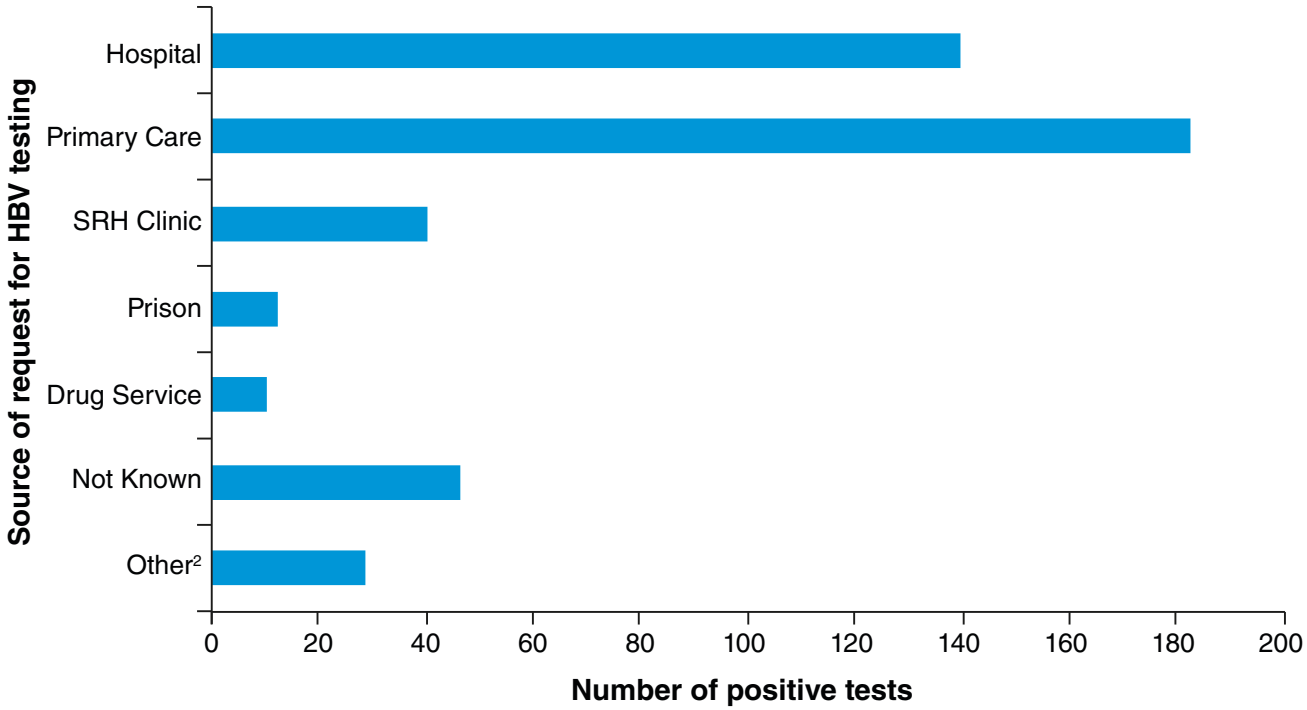
FIGURE 1a: Number of individuals tested for HBV by source of test request, Scotland, 2015.[1]



SRH: Sexual and Reproductive Health.

1. Excludes routine screening tests: antenatal, renal and occupational health.
2. Testing is based on an individual's first HBsAg test in the year only except in SRH clinics where testing is based on an individual's first HBsAg or HBcAb test.
3. Other sources includes tests from for example, counselling clinics and family planning settings but may include some occupational or other routine screens.

FIGURE 1b: Number of individuals newly diagnosed HBV positive by source of test request, Scotland, 2015.[1]



SRH: Sexual and Reproductive Health.

1. Excludes positive results from routine screening tests: antenatal, renal and occupational health.
2. Other sources includes positive results from for example, counselling clinics and family planning settings but may include some occupational or other routine screens.

TABLE 1: Demographic data on the population undergoing HBV testing in Scotland, including proportion positive, 2015.

Group	Number of individuals tested	Number of positive tests (% positive)
Gender		
Female	34001	165 (0.5)
Male	36532	288 (0.8)
Unknown	202	4 (2.0)
Age band		
<15	808	6 (0.7)
15-24	10489	54 (0.5)
25-34	17693	178 (1.0)
35-44	12863	109 (0.8)
45-54	10431	49 (0.5)
55-64	8010	29 (0.4)
≥65	10239	32 (0.3)
Unknown	202	0 (0)
Ethnic group[1]		
British	54868	107 (0.2)
Non-British	15867	350 (2.2)
SIMD Quintile		
1	18019	166 (0.9)
2	12607	79 (0.6)
3	10580	48 (0.4)
4	10036	53 (0.5)
5	9437	30(0.3)
Unknown	10056	81 (0.8)
Total	**70735**	**457 (0.6)**

1 8,239 (12%) individuals who could not have their ethnicity classified by the name classification software or were classified as diaspora were assumed to be non-British; 69 (0.8%) of these individuals had a new positive HBsAg test. Ethnic group is classified using name classification software.[6] Approximately 5% of people with assigned British ethnicity will not be of British origin, while approximately 25% of people with assigned non-British ethnicity will indeed be British.

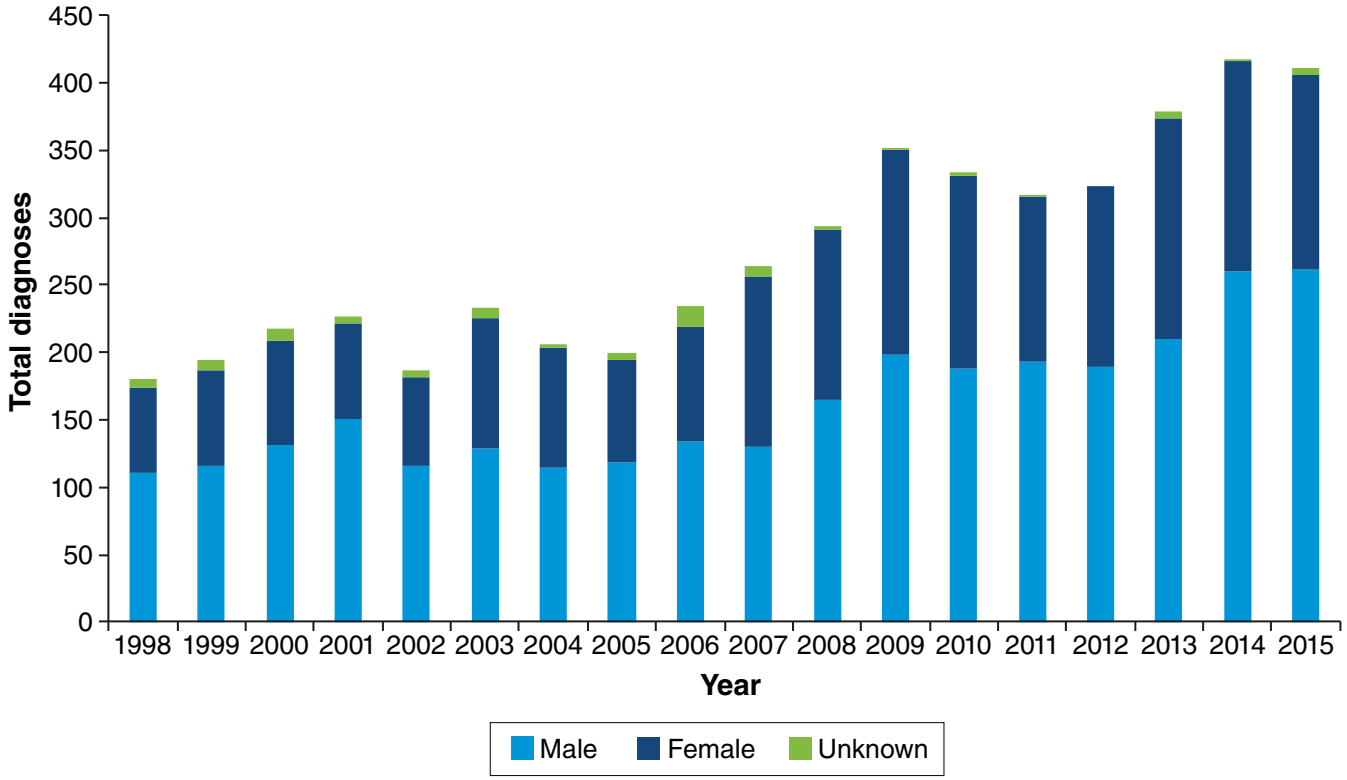
Testing data are based on first HBsAg test (or first HBcAb test in the SRH setting) in 2015. Individuals testing HBV positive in previous years have been excluded. Therefore, all tests on individuals are diagnostic ones.

These data indicate a decrease in the annual numbers of acute infections: in the years preceding the SHBBV framework, (2007-2011), using an algorithm based on laboratory positive diagnoses of HBsAg with a positive HBcIgM within 14 days, there was an annual average of 52 diagnoses. Using the same algorithm, the number of probable diagnoses decreased to an average of 30 per year between 2012 and 2015. Further refinement of the probable diagnoses using the enhanced surveillance form has resulted in the lower numbers recorded in 2014 and 2015.

Chronic hepatitis B infection: 2015 and recent trends

There has been an increasing trend in new reports of chronic HBV during the past 17 years, with the highest number of cases being diagnosed in 2014 (417) (Table 2). However, the number of new diagnoses over the past eight years has remained steady at between 300-400 new diagnoses per year, and a five-year annual average of 369. Since the current database began in 1998, there has been a consistent pattern of more diagnoses occurring in men than women, and in 2015 there was a 1.8:1 ratio of male to female diagnoses (Figure 2).

FIGURE 2: Annual number of chronic HBV diagnoses by gender, Scotland, 1998 - 2015.



In 2015, there were 411 new reports of chronic HBV infection in Scotland. Of these, 42% (172) were diagnosed in NHS Greater Glasgow and Clyde, 18% (74) in NHS Lothian and 12% (49) in NHS Grampian. The rates per 100000 population diagnosed in each NHS board area in 2015 are shown in Table 3[9] with the highest rates per 100000 population recorded in NHS Greater Glasgow and Clyde (8.1 per 100000) and 4.6 per 100000 in both NHS Lothian and NHS Grampian. During the past five years, the majority of diagnoses in Scotland have been in NHS Greater Glasgow and Clyde (736/1846, 40%) with 21% (389/1846) in NHS Lothian and 14% (256/1846) in NHS Grampian (Table 2). This is also reflected in the cumulative totals since 1998.

The majority of chronic diagnoses made in 2015 were among both men and women in the 25-34 year age group (39%), with a further 26% in the 35-44 year age group, a consistent finding over the past five years (Table 4). The median age for men was 33 years (IQR, 27-42 years), and for women, 34 years (IQR, 26-44 years).

TABLE 2: Laboratory positive chronic HBV diagnoses by NHS board, Scotland, 2011-2015 and cumulative total, 1998-2015.

NHS board[1]	2011	2012	2013	2014	2015	Cumulative total 1998-2015[2]
Ayrshire and Arran	*	*	0	33	20	104
Borders	*	*	6	*	*	30
Dumfries and Galloway	6	11	*	*	*	67
Fife	8	9	9	15	18	143
Forth Valley	*	*	*	*	6	41
Grampian	63	48	57	39	49	641
Greater Glasgow and Clyde	113	145	130	176	172	2068
Highland	6	*	5	15	18	81
Lanarkshire	20	17	30	32	23	327
Lothian	68	60	109	78	74	1140
Orkney	0	*	0	0	0	9
Shetland	*	*	*	0	*	*
Tayside	20	18	29	21	26	304
Western Isles	*	*	0	*	0	*
Scotland	**316**	**323**	**379**	**417**	**411**	**4966**

1. NHS board of testing and diagnosis.
2. The cumulative total of chronic HBV diagnoses reflects the total number who remain chronically infected at the end December 2015; the total excludes those who have resolved their infection, died, or left Scotland.

TABLE 3: Laboratory positive chronic HBV diagnoses by gender and NHS board: number and rate per 100000, Scotland 2015.

NHS board	Male: Number	Male: Rate per 100000	Female: Number	Female: Rate per 100000	Total: Number	Total: Rate per 100000
Ayrshire and Arran	10	3.1	9	7.5	20	3.0
Borders	*	*	*	*	*	*
Dumfries and Galloway	*	*	*	*	*	*
Fife	8	2.5	10	8.3	18	2.7
Forth Valley	*	*	*	*	6	1.1
Grampian	31	5.8	18	9.2	49	4.6
Greater Glasgow and Clyde	120	11.7	51	12.8	172	8.1
Highland	12	4.2	5	5.0	18	3.1
Lanarkshire	15	2.6	8	3.6	23	1.9
Lothian	45	5.8	28	9.3	74	4.6
Orkney	0	0.0	0	0.0	0	0.0
Shetland	0	0.0	0	0.0	*	*
Tayside	18	4.9	8	5.9	26	3.5
Western Isles	0	0.0	0	0.0	0	0.0
Scotland	**262**	**15.1**	**144**	**8.0**	**411**	**11.6**

The total may include those for whom there is no information on gender.

The rates per 100000 are calculated using the GROS mid-year population data for those aged 15-64.

TABLE 4a: Laboratory diagnoses of chronic HBV in men by age group, Scotland, 2011-2015.

Age group	2011	2012	2013	2014	2015
15-24	9	6	11	24	24
25-34	56	73	80	93	113
35-44	73	61	63	73	69
45-54	26	24	29	39	28
55-64	17	14	15	21	12
≥65	8	8	8	8	14
Unknown	1	0	0	0	0
Total	**193**	**189**	**210**	**260**	**262**

TABLE 4b: Laboratory diagnoses of chronic HBV in women by age group, Scotland, 2011-2015.

Age group	2011	2012	2013	2014	2015
15-24	5	*	15	15	21
25-34	56	75	86	73	45
35-44	29	35	39	41	38
45-54	14	7	9	12	18
55-64	10	8	8	*	7
≥65	5	*	5	*	11
Total	**122**	**134**	**164**	**156**	**144**

TABLE 4c: Laboratory diagnoses of chronic HBV by gender, Scotland, 2011-2015.

Gender	2011	2012	2013	2014	2015
Male	193	189	210	260	262
Female	122	134	164	156	144
Unknown	1	0	5	1	5
Total	**316**	**323**	**379**	**417**	**411**

Chronic hepatitis B infection: characteristics of the chronic diagnosed HBV cohort in Scotland, 1998-2015

The cumulative total of chronic HBV individuals diagnosed and living in Scotland is 4966, based on data from 1998 to 2015. This total excludes those who have either resolved their infection, died, or left Scotland but includes those aged under 15 years at the end of 2015.

The majority (59%) of those with chronic HBV in the diagnosed Scottish cohort are males (2913) with 1963 (40%) females and a further 90 (2%) for whom no gender is recorded. The cohort is further characterised by the 73% of chronic HBV occurring in the non-British ethnic groups (3632/4966) as defined using name classification software. Furthermore, of those for whom it was possible to provide an SIMD status, over one third (37%, 1357/3694) live in the most deprived areas of Scotland (Table 5).

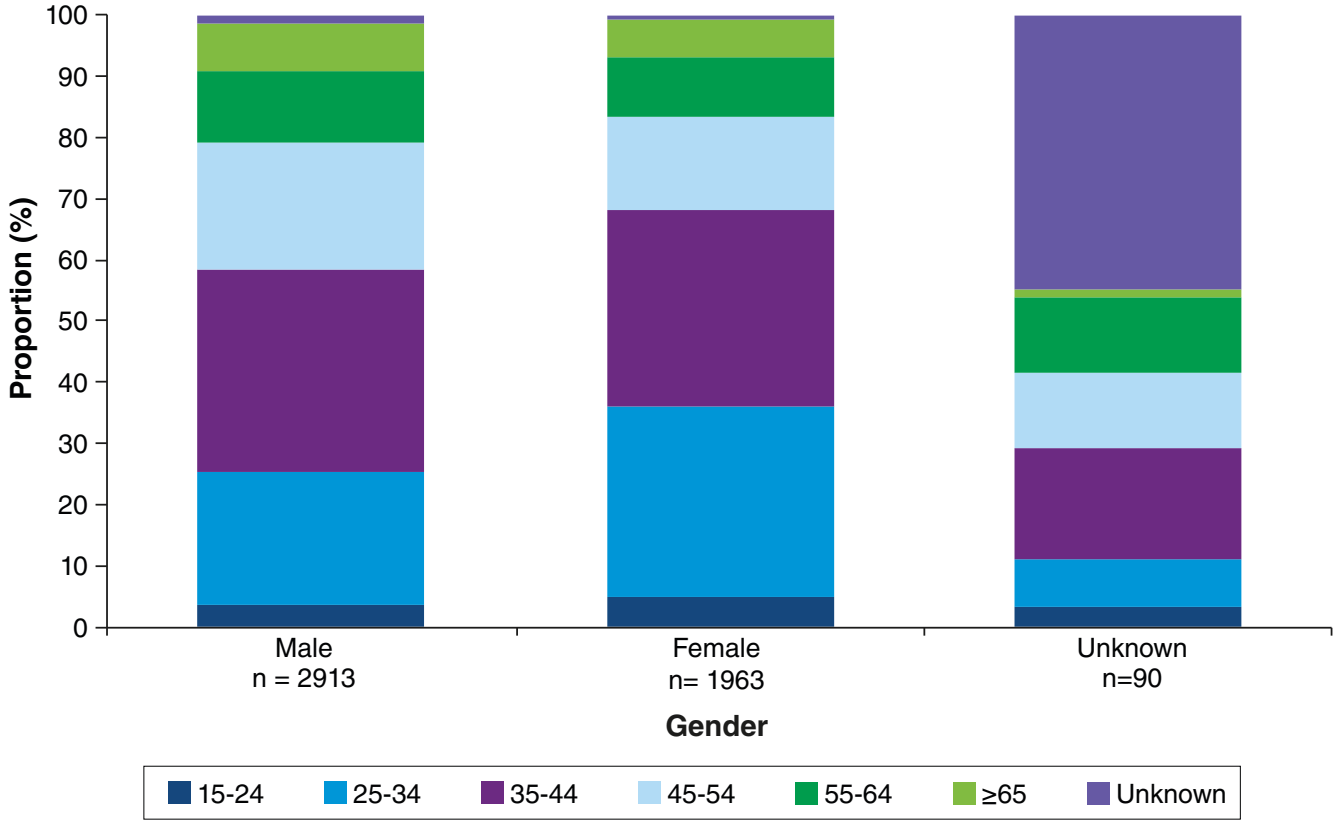
TABLE 5: Chronic diagnosed HBV cohort by gender, ethnic group and deprivation, Scotland 1998-2015.

Group	Total number[1] (% of total)
Gender	
Male	2913 (59%)
Female	1963 (40%)
Unknown	90 (2%)
Total	**4966 (100%)**
Ethnic group[2]	
British	1334 (27%)
Non-British	3632 (73%)
Total	**4966 (100%)**
SIMD Quintile	
1	1357 (27%)
2	704 (14%)
3	549 (11%)
4	491 (10%)
5	593 (12%)
Unknown	1272 (26%)
Total	**4966 (100%)**

1. The cumulative totals reflect the total number who remain chronically infected at the end December 2015; the total excludes those who have resolved their infection, died, or left Scotland.
2. Ethnic group is classified using name classification software. Approximately 5% of people with assigned British ethnicity will not be of British origin, while approximately 25% of people with assigned non-British ethnicity will be British. Additionally,19% of residents either could not have their ethnicity classified by the name classification software or were classified as diaspora and as such, were assumed to be non-British.

One third of all chronic HBV diagnoses were made in both men and women aged 35-44 years (33% and 32% of male and female diagnoses, respectively). In women, 63% of diagnoses were in those aged 25-44 while in men three quarters were in those aged 25-54 (Figure 3).

FIGURE 3: Chronic diagnosed HBV cohort by age group and gender: proportion of total, Scotland, 1998-2015.



There is a higher proportion of diagnoses within the non-British ethnic group when considering both gender and age group. Almost three quarters of both the male and female chronically infected diagnosed cohort are of non-British ethnicity (71% and 74%, respectively).

Over three quarters (77%) of the cohort are currently aged between 25 and 54 years and 78% of these are of non-British ethnicity (Table 6). The chronically infected British cohort are, in general, older than the non-British cohort, with 53% in the 35-54 age group and a further 32% over the age of 55. In contrast, two thirds (66%) of the non-British cohort are aged 25-44 years, with 13% aged over 55 (Table 6). Furthermore, a highly significant association was found between ethnic group and age (450.8, $p<0.001$).

TABLE 6: Chronic diagnosed HBV cohort by age group and ethnic group, Scotland 1998-2015.

Age group	British	Non-British	Total
15-24	45	156	201
25-34	148	1102	1250
35-44	346	1250	1596
45-54	325	585	910
55-64	209	320	529
≥65	208	134	342
Total	**1281**	**3547**	**4828**

A chi-squared test was carried out to test the association between age and ethnicity and a highly significant association was observed (450.8, $p<0.001$).

Age data were missing for 2% of diagnoses (100).

Ethnic group is classified using name classification software. Approximately 5% of people with assigned British ethnicity will not be of British origin, while approximately 25% of people with assigned non-British ethnicity will be British. Additionally,19% of residents either could not have their ethnicity classified by the name classification software or were classified as diaspora and, as such, were assumed to be non-British.

The Scottish Index of Multiple Deprivation (SIMD) identifies small area concentrations of multiple deprivation across Scotland in a consistent way. These small areas are ranked from most deprived (rank 1) to least deprived (rank 5). A highly significant association was found between SIMD and age (180.4 $p < 0.001$) (Table 7). Within the most deprived group (SIMD 1), the majority of diagnoses (68%) occurred in those aged 25-44 contrasting with the least deprived group (SIMD 5) where the majority of diagnoses (67%) occurred in older age groups (35-64). This suggests a general trend with the proportion of diagnoses increasing with increasing age across SIMD 1 to SIMD 5. It also seems to demonstrate that chronic HBV infection predominantly affects younger individuals in the more deprived communities and older individuals in the less deprived communities.

No association was found between gender and SIMD, with similar proportions of male and female diagnoses being found across each SIMD quintile. However, a moderately significant association was found between SIMD and ethnic group (16.96 $p=0.002$) (Table 7). Over one third (37%, 1357/3694) of the chronically infected HBV cohort are living in the most deprived areas in Scotland. Across all SIMD categories, the majority of diagnoses were made in non-British ethnic groups. Furthermore, 57% (1464/2555) of diagnoses in non-British ethnic groups occurred in SIMD 1 and 2. This suggests that ethnic communities living in the most deprived areas of Scotland are disproportionately affected by chronic HBV infection.

TABLE 7: Gender, age group and ethnic group by deprivation profile of the chronic diagnosed HBV cohort, Scotland 1998-2015.

SIMD quintile	1	2	3	4	5	Total
Gender						
Male	769 (56.7%)	415 (58.9%)	315 (57.4%)	268 (54.6%)	322 (54.3%)	1606
Female	588 (43.3%)	289 (41.1%)	234 (42.6%)	223 (45.4%)	271 (45.7%)	2088
Total	1357 (100%)	704 (100%)	549 (100%)	491 (100%)	593 (100%)	3694
Age group						
15-24	67 (5%)	39 (5.6%)	18 (3.3%)	22 (4.5%)	13 (2.2%)	159
25-34	456 (34%)	210 (30%)	128 (23.4%)	112 (23.1%)	103 (17.5%)	1009
35-44	462 (34.4%)	193 (27.6%)	178 (32.6%)	151 (31.2%)	160 (27.1%)	1144
45-54	196 (14.6%)	138 (19.7%)	102 (18.7%)	98 (20.2%)	129 (21.9%)	663
55-64	107 (8%)	71 (10.1%)	73 (13.4%)	62 (12.8%)	104 (17.6%)	417
≥65	54 (4%)	49 (7%)	47 (8.6%)	39 (8.1%)	81 (13.7%)	270
Total	1342 (100%)	700 (100%)	546 (100%)	484 (100%)	590 (100%)	3662
Ethnic group						
British	366 (27%)	231 (33%)	187 (34.1%)	171 (34.8%)	184 (31%)	1139
Non-British	991 (73%)	473 (67%)	362 (65.9%)	320 (65.2%)	409 (69%)	2555
Total	1357 (100%)	704 (100%)	549 (100%)	491 (100%)	593 (100%)	3694

A chi-squared test was carried out to test the association between SIMD, age group and ethnic group. A significant association was observed between SIMD and age group (180.4, $p<0.001$) and between SIMD and ethnic group (16.96; $p=0.002$). No association was found between SIMD and gender (3.8; $p<=0.433$).

Age data were missing for 2% (100) of diagnoses and SIMD quintile data were missing for 26% (1272) of diagnoses.

Ethnic group is classified using name classification software. Approximately 5% of people with assigned British ethnicity will not be of British origin, while approximately 25% of people with assigned non-British ethnicity will be British. Additionally, 5% of residents in the SIMD linked data set either could not have their ethnicity classified by the name classification software or were classified as diaspora and as such, were assumed to be non-British.

Hepatitis D infection: testing and positivity

Hepatitis D infection is caused by the hepatitis D virus (HDV), an 'incomplete' virus which requires the presence of hepatitis B virus to replicate, and therefore infect, an individual. Transmission can occur simultaneously with HBV as a coinfection or as superinfection in those chronically infected with HBV. Co-infection or superinfection with HDV may result in more severe illness and rapid progression of liver disease. It is anticipated that all new HBV diagnoses are tested for HDV using a combination of HDV antibody, antigen and more recently PCR testing available in either of the two BBV specialist testing laboratories, in NHS Greater Glasgow and Clyde and since 2014, in NHS Lothian. The proportion of new HBV diagnoses being tested has increased threefold since 2004 with 84% of new diagnoses now being tested for HDV within a year of HBV diagnosis. Between 2010 and 2014 (latest data available) there was an average of six HDV diagnoses per year, giving an average positivity rate of 1.7%.

HBV screening of blood donations by the Scottish National Blood Transfusion Service (SNBTS)

SNBTS screens donations for a number of infectious diseases, including HBV. Since 1998, over 4.5 million donations have been tested for HBV (comprising approximately 90% donations from repeat donors and 10% from newly registered donors), with an average of around 212000 individuals tested each year during the past five years. Between 1998 and 2015, there has been a total of 139 diagnoses of HBV in blood donors, a rate of 3.0 per 100000 donations tested. The majority of diagnoses were among new donors (109) at a rate of 23.0 per 100000 donations tested compared to 0.7 per 100000 (30) in repeat donors. The majority (70%) of positive donors were men, and data on those whose ethnic group was available indicate that 54% were White, 12% were Chinese or Other Asian, and 9% were of Indian/Pakistani/Bangladeshi ethnicity. Donors are informed of their diagnosis and referred on to specialist treatment and care services.

Antenatal testing for hepatitis B

The antenatal screening programme for HBV testing began officially in 2002/2003, although some testing had been ongoing in some NHS board areas for several years before this. There is currently no national surveillance programme to monitor uptake of HBV testing in this setting although local NHS board data suggest that a high proportion of pregnant women take up the offer of testing. The information presented here is based on the data extracted from the database of laboratory tests where the source of test request can be defined as the antenatal setting (Table 8). In the last few years, the annual number of live births, according to GROS, is in the order of over 55000 (and there are other pregancy outcomes); the data in Table 8, therefore, underestimate the number of antenatal HBV tests representing around three quarters of the cohort being tested in the antenatal setting.

TABLE 8: Number (and proportion positive) by ethnic group for all HBV surface antigen tests in the antenatal setting, Scotland, 2011-2015.

Year	Number of women tested	Number of positive tests (% positive)	Number positive: British	Number positive: Non-British
2011	35980	126 (0.35)	23	103
2012	35356	145 (0.41)	19	126
2013	37254	133 (0.36)	32	101
2014	42160	131 (0.31)	11	120
2015	43002	113 (0.26)	12	101

Testing data prior to 2014 may not be complete for some NHS boards due to data retrieval issues via ECOSS.

Using the data available, the number of pregnant women being tested as part of the antenatal screening programme in Scotland has increased during the past five years from nearly 35600 in 2011 to over 43000 in 2015. The positivity rate per year has varied from 0.3% to 0.4% during this time (Table 8). In each year, the majority (>80%) of women testing positive for HBV were of non-British ethnicity and likely to originate from areas of high HBV prevalence.

Paediatric infection: testing and positivity

Using data on first positive HBsAg test in each year, the number of tests among those aged <15 years has increased between 2011 and 2015. In general, there are fewer than ten diagnoses per year (Table 9).

At the end of 2015, there were 38 young people aged <15 years who were diagnosed and living with chronic HBV infection, 60% of whom were male and 71% were of non-British ethnicity.

TABLE 9: Number (and proportion positive) of all HBV surface antigen tests among children (aged < 15 years), 2011-2015.

Year	Number of tests	Number of positive tests (% positive)
2011	553	8 (1.4)
2012	630	3 (0.5)
2013	731	8 (1.1)
2014	925	4 (0.4)
2015	793	6 (0.8)

Testing data prior to 2014 may not be complete for some NHS boards due to data retrieval issues via ECOSS.

Individuals are counted only once in each year.

Vaccination uptake

HBV vaccination policy in the UK, set by the Department of Health, currently recommends a selective programme where individuals whose occupation or lifestyle puts them at risk of infection.[3]

As part of monitoring for the HBV indicators (Outcome 1) in the SHBBV framework, HPS worked with health protection teams to gather vaccine uptake data in those babies born to infected mothers who are eligible for vaccine (with or without immunoglobulin). In the survey of babies born to HBV infected mothers during 2013, 98% (121/123) of babies received three doses of vaccine by their first birthday. Among those born during 2012, 95% (105/111) received four vaccine doses by their second birthday. At this time, data were available from five NHS boards (NHS Ayrshire and Arran, NHS Grampian, NHS Greater Glasgow and Clyde, NHS Lothian and NHS Tayside). The survey completed previously in 2012 indicated a similar uptake among eleven NHS board areas which were able to supply data.

In Scotland, the hepatitis B vaccine was introduced for all prisoners in 1999. A recent evaluation of this public health intervention among PWID concluded that vaccine uptake in this group has continued to increase since the introduction of the prison programme, and that having been vaccinated was associated with incarceration. Indeed, the parallel decrease in acute HBV and markers of HBV infection indicates the success in reducing HBV transmission in this group. The current prevalence of ever infection (9%) or chronic infection (0.9%) among Scottish PWID is lower than that reported in many other European countries.[10] Data from the NESI 2013/14 report (available at http://www.uws.ac.uk/research/research-institutes/social-sciences/health-behaviours-and-policy/needle-exchange-surveillance-initiative/) indicate that 61% of all those who responded to the survey question had received three or more doses of hepatitis B vaccine, an increase of 9% since 2008/09.

In an audit of hepatitis B vaccine uptake among MSM attending sexual and reproductive health clinics in Scotland during 2006/2007, 81% of men were eligible to receive vaccine and 82% of them commenced vaccination. At this time, the completion rate was 31%.[11] This audit predates the use of the new national clinical IT system for sexual health, NaSH. The authors predicted this system would help to improve uptake with the facility for recalling men for their vaccination.

Treatment and care for chronic hepatitis B infection

Data on those attending for treatment and care are gathered using a survey of treatment centres in Scotland. The most recent survey was performed in 2015 with data on individuals with chronic HBV infection who attended for treatment/care during 2014. Results were received from 20 of the 23 clinical services across the mainland NHS boards in Scotland. This survey has been performed on two previous occasions, firstly for baseline data in 2009 and in 2012. During 2014, an estimated 1951 HBV chronically infected patients (including 27 children in paediatric services) attended for treatment and care. The largest proportion of those attending services in 2014 was of East Asian (Chinese/Hong Kong Chinese) ethnicity (40%), with 19% White British, 12% other Asian (for example, Indian, Pakistani, Bangladeshi), 10% African, 10% Eastern European, and 2% other (e.g. American) ethnicities. Of the 1951 individuals attending treatment and care services, 383 (20%) were considered to be eligible for therapy according to the European Association for the Study of the Liver (EASL)[7] or the National Institute for Health and Care Excellence (NICE)[8] guidelines (Table 9). Of those eligible, 95% (362) were receiving treatment with 64% (231) receiving nucleo(s)tide treatment for more than 12 months. An optimal antiviral response was noted in 211 of 231 (91%) individuals treated although this varied by clinic/NHS board (Table 10). The total number may be an underestimate as not all clinics were able to submit data.

Outcomes of infection

Using data linkage to hospital admissions data (the Scottish Morbidity Record, SMR, database) progression to advanced liver disease was examined, particularly among those newly diagnosed with HBV. Advanced liver disease in this analysis includes hepatocellular carcinoma, ascites, hepatic encephalopathy or failure, hepato-renal syndrome or bleeding oesophageal varices. The analysis was performed to address one of the HBV indicators for Outcome 3 (people affected by BBVs lead longer healthier lives) of the SHBBV framework.

In the past ten years, among those diagnosed with HBV, there have been on average 18 diagnoses of advanced liver disease per year, ranging from nine to 26 in any one year. Indeed, there is evidence that a fraction of these diagnoses were among individuals who received their HBV diagnosis within the preceding year. This suggests that there are a number of individuals who are presenting with advanced HBV disease who remain unaware of their infection.

TABLE 10: Treatment of patients with chronic HBV infection in 2014 by NHS board.

NHS board[1]	Estimated total number attending	Number and proportion (%) eligible for antiviral therapy	Number and proportion (%) of eligible patients receiving therapy	Number and proportion treated[2]	Number and proportion (%) treated who achieved optimal response[3]
	A	B (% of A)	C (% of B)	D (% of C)	E (% of D)
Ayrshire & Arran	60	15 (25)	15 (100)	15 (100)	15 (100)
Borders	50	15 (30)	11 (73)	*	*
Dumfries & Galloway	56	21 (38)	21 (100)	16 (76)	15 (94)
Fife	32	14 (44)	13 (93)	9 (69)	7 (78)
Forth Valley	52	21 (40)	21 (100)	20 (95)	20 (100)
Grampian[1]	162	9 (6)	9 (100)	0 (0)	0 (0)
Greater Glasgow and Clyde[1]	721	124 (17)	113 (91)	78 (69)	70 (90)
Highland	71	11 (15)	10 (91)	*	*
Lanarkshire[1]	50	20 (40)	18 (90)	16 (89)	12 (75)
Lothian[1]	229	62 (27)	60 (97)	56 (93)	54 (96)
Orkney	N/A	N/A	N/A	N/A	N/A
Shetland	N/A	N/A	N/A	N/A	N/A
Tayside	468	71 (15)	71 (100)	13 (18)	11 (85)
Western Isles	N/A	N/A	N/A	N/A	N/A
Scotland (%)	**1951**	**383 (20)**	**362 (95)**	**231 (64)**	**211 (91)**

N/A There are no clinics in the island NHS boards. Patients attend for treatment and care at clinics in the mainland NHS boards.

The data relate to the estimated number of patients with chronic HBV infection who attended for treatment/care during January to December 2014.

1. NHS Grampian data presented are from the Gastroenterology Unit at Aberdeen Royal Infirmary. Data were not available from the Infectious Diseases Unit.
   NHS Greater Glasgow & Clyde data presented are from three services, but do not include those from the Gastroenterology Unit at Gartnavel General Hospital. (optimal response ranges from 88-92%).
   NHS Lanarkshire data presented are from the Area Infectious Diseases Unit at Monklands Hospital. Data were not available from the Gastroenterology Unit at Hairmyres Hospital.
   NHS Lothian data presented are from the Royal Infirmary of Edinburgh. Data were not available from the Infectious Diseases Unit at the Western General Hospital.
2. Eligible for therapy according to the European Association of the Study of the Liver guidelines (2012)/ the National Institute for Health and Care Excellence guidelines (2013).
3. Treatment uptake and optimal response to therapy are measured among those treated with nucleo(s)tide analogues for >12 months during Jan 2013- Dec 2014.

Comment

In Scotland, an estimated 9000 people are living with chronic hepatitis B infection.[4] The data presented here indicate that almost 5000 of these individuals have been diagnosed. Thus, there remain an estimated further 4000 who may be undiagnosed at this time. Information on the profile of our current cohort indicates that most are of non-British ethnicity and likely to originate from high HBV prevalence countries such as those in South and South East Asia. While this group comprises 4% of the population in Scotland,[12] our data suggest they are disproportionately affected by HBV. Members of this group are also more likely to be living in the most deprived communities in Scotland.

An effective vaccine has been available since the 1980s and recent data indicate successful coverage in both babies at risk of infection and in PWID, resulting in reductions in infection. Among PWID this has complemented the achievement of other harm reduction tools introduced in the late 1980s when levels of acute HBV infection were higher than in recent years. Levels of uptake are uncertain for other groups at risk but what is clear is that acute HBV infection is at the lowest level for several decades.

The World Health Organisation (WHO) launched a global elimination strategy which includes targets to help achieve this.[13] By 2020, 90% of those infected should be aware of their diagnosis, 90% of those eligible should be on treatment and, of these, 90% should have an optimal treatment response. The data indicate that, in Scotland, while the treatment targets are being achieved, the diagnosis target is not. Indeed, there is evidence from the data on advanced liver disease that infected individuals are presenting and being diagnosed late.

While there are high levels of testing in clinical settings, this report highlights the need for further case finding, potentially targeting groups at risk, to identify those infected who might benefit from specialist treatment and care.

Further data on HBV will be available on the new open access data portal planned for launch later in Spring 2017. These will be available via the HPS website.

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NHS board abbreviations

AA	Ayrshire & Arran	BR	Borders	DG	Dumfries & Galloway	GGC	Greater Glasgow & Clyde
FF	Fife	FV	Forth Valley	GR	Grampian	HG	Highland
LO	Lothian	LN	Lanarkshire	OR	Orkney	SH	Shetland
TY	Tayside	WI	Western Isles				

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