

ORIGINAL ARTICLES

Hepatitis C Virus Infection in Scotland: Epidemiological Review and Public Health Challenges

SJ Hutchinson, KM Roy, S Wadd, SM Bird, A Taylor, E Anderson, L Shaw, G Codere, DJ Goldberg

SJ Hutchinson, Health Protection Scotland, Glasgow, UK, and Department of Statistics and Modelling Science, University of Strathclyde, UK

KM Roy, S Wadd, E Anderson, L Shaw, G Codere, DJ Goldberg, Health Protection Scotland, Glasgow, UK

SM Bird, MRC Biostatistics Unit, Institute of Public Health, Cambridge, UK, and Department of Statistics and Modelling Science, University of Strathclyde, UK

A Taylor, School of Social Sciences, University of Paisley, UK

Correspondence to:

Dr Sharon Hutchinson
Health Protection Scotland
Clifton House
Clifton Place
Glasgow G3 7LN
UK
Email sharon.hutchinson@hps.scot.nhs.uk.

Abstract

Introduction

In 2004, Scotland's Health Minister stated that the hepatitis C virus (HCV) "is one of the most serious and significant public health risks of our generation".

Methods

To appreciate the prevention and care challenges posed by HCV in Scotland, we reviewed all country-specific data on i) the prevalence of infection among different populations, ii) the numbers infected with HCV, and iii) the current and future HCV disease burden.

Results

An estimated 1% of Scotland's population has HCV; 85-90% of those infected were injecting drug users (IDUs). Reductions in HCV prevalence among young IDUs during the early 1990s suggest that the incidence of HCV had decreased; since then, the absence of further reductions highlight that existing prevention measures are insufficient. Two-thirds of the estimated 37,500 chronically HCV-infected individuals in Scotland remain undiagnosed and two-thirds of this group are former IDUs. An estimated 9,000 former IDUs were living with either moderate or severe HCV disease in 2004; if the current uptake of antiviral therapy continues, this number was estimated to double by 2016. Approximately 1,200 HCV-infected IDUs had developed liver failure by 2004; this figure was predicted to increase to 3,200 by 2020.

Conclusions

Scotland faces three principal public health challenges: i) the prevention of HCV among current IDUs, ii) the diagnosis of HCV-infected persons, particularly those most in need of therapy to prevent severe HCV disease, and iii) the current and future provision of adequate resources to ensure that the movement of patients through the diagnostic and clinical care pathway is optimal.

Keywords

hepatitis C; prevalence; prevention; diagnosis; burden

Introduction

It is estimated that 170 million people worldwide are infected with the hepatitis C virus (HCV).¹ The virus, identified in 1989,² is transmitted primarily through percutaneous exposure though it can be spread by unprotected sexual intercourse and from mother to child.³ There is no vaccine against HCV. Between 5-10% of chronically infected persons develop cirrhosis within 20 years of infection⁴; factors associated with more rapid disease progression are older age at time of infection, male gender, excessive alcohol consumption and co-infection with HIV.⁵⁻⁶ A sustained viral clearance is achieved in 50-60% of individuals treated with Pegylated Interferon and Ribavirin.⁷⁻⁸ The National Institute for Clinical Excellence deems such therapy cost-effective⁹ and the British Society of Gastroenterology recommends that infected persons who have progressed to moderate hepatitis and who have no contraindications to treatment should be offered it.¹⁰

Because of HCV's association with injecting drug use (IDU) and Scotland having one of the highest prevalences of this behaviour in western Europe, it was recognised, in the early-mid 1990s, that a considerable proportion of the Scottish IDU population was likely to be infected. Since then, Health Protection Scotland (HPS) and collaborating institutions, particularly HCV testing laboratories, have run a programme of surveillance, survey and statistical modelling initiatives to determine the extent and characteristics of the country's HCV infection/disease burden. In 2004, Scotland's Health Minister stated that hepatitis C "is one of the most serious and significant public health risks of our generation"¹¹. To appreciate fully the current and future prevention and care challenges posed by HCV in Scotland, the authors report and review all country-specific data on i) the prevalence of infection among different population groups, ii) estimates of persons

infected with HCV and, iii) estimates of the current and future HCV disease burden.

Method for review

A literature search via the PubMed database of published articles covering the period January 1989 to December 2004 was undertaken; a search involving the use of the terms - "hepatitis C" or "HCV" and "prevalence" and "Scotland" - in titles or abstracts, was used to identify articles which had examined the prevalence of HCV among different populations in Scotland; additional searches, using the names of key authors involved in HCV-related research in Scotland, were undertaken. Non-peer reviewed publications that incorporated surveillance data, such as laboratory reports of confirmed HCV positive cases, were reviewed.^{12, 13}

Prevalence of HCV among different populations in Scotland

The prevalence of HCV in Scotland varies considerably depending on the population studied (Table 1).

Pregnant women

The prevalence of HCV antibodies among women giving birth in Scotland during 2000 was 0.3-0.4%¹⁴; this rate was higher than that estimated for England/Wales (0.15%)¹⁵ though lower than estimates for the rest of Western Europe (1-2%),¹⁶ the United States (2-4%)^{17, 18, 19} and Australia (1.1%).²⁰ It is estimated that approximately ten HCV-infected babies are born in Scotland annually.¹⁴ HCV prevalence among women giving birth in Scotland was highest (i) among 25-29 year olds (0.4-0.6%), (ii) in high deprivation areas (0.9-1.1%), and (iii) in Greater Glasgow (0.8-1.0%)¹⁴; these observations are consistent with the majority of infected women having injected drugs. A study of pregnant women in Dundee during 1997 found a significantly higher HCV prevalence among those who reported injecting drug use (41% of 17) than those who had not (0.45% of 3,531) ($p < 0.0001$).²¹

Children

During June 2002, a pilot study to investigate the feasibility of collecting an oral fluid specimen from healthy children and testing it anonymously for HCV antibodies was undertaken in Glasgow's Dental Hospital; two (3%: 95% CI 0.4-10.3%) of 70 children, aged 3-10 years, were HCV antibody positive.²²

Blood donors

The prevalence of HCV among Scottish blood donors decreased from 0.09% in 1991 to 0.008% in 2003,^{23, 24} a rate which was higher than that detected in England/Wales (0.005% in 2003²⁵) and lower than that reported in the United States (0.06% in 2002).²⁶ The prevalence among new (and repeat) Scottish donors decreased from 0.3% (0.06%) in 1991 to 0.04% (0.004%) in 2003.²³

Recipients of blood and blood products

Prior to 1985, most patients with clotting disorders were exposed to HCV through the receipt of contaminated blood products. Evidence of HCV was found in all but one of 78 haemophiliacs treated with non-virus inactivated clotting factor

concentrates in Edinburgh.²⁷ In 1985, heat treatment of clotting factor concentrates for haemophiliacs was introduced in Scotland.²⁸

In 1991, the prevalence of HCV among patients of three renal dialysis units in Glasgow was 3.9% (19/483).²⁹ HCV antibody testing of all dialysis unit patients at initial entry and at six monthly intervals thereafter, has since been implemented.

Other patient groups

The HCV prevalence among 16-49 year old male patients who were undergoing, or were eligible to undergo, surgery in North Glasgow hospitals during 1996-1997 was 3.8% (103/2,702).³⁰ While the risk of HCV transmission from patients to surgeons is low (see 3.6 below), the above prevalence indicates that surgeons working in areas – such as Glasgow – of high IDU prevalence and high HCV prevalence among IDUs will not infrequently operate on HCV-infected patients.

Of 80 patients with histologically confirmed liver cancer presenting to the Royal Infirmary of Edinburgh during 1985-1994, 30% were found to be HCV antibody positive.³¹ This study highlighted that chronic HCV infection could be a major risk factor for the development of hepatocellular carcinoma in Scotland.

Healthcare workers

The prevalence of HCV antibodies among healthcare workers from Glasgow during the mid-1990s was low (0.28% of 8,412)³² and comparable with those reported in England (0.21%, 0.28%).^{33, 34} The Glasgow study indicated that undertaking exposure-prone procedures (EPP) does not necessarily convey an increased risk of HCV acquisition (0.23% of 2,205 EPP staff and 0.3% of 6,207 non-EPP staff were HCV positive). This finding was corroborated by a study which revealed a 0.1% HCV prevalence among 880 dental healthcare workers in the West of Scotland.³⁵ No instances of HCV transmission between healthcare workers and patients in Scotland have been identified.

Genitourinary Medicine Clinic Attenders

The HCV prevalence among non-injecting heterosexual men and women, and men who have sex with men who attended genitourinary medicine clinics in Scotland during 1996-1997 was 0.8% (32/4,135), 0.3% (10/3,035) and 0.6% (4/668), respectively.³⁶ These findings are consistent with the prevailing view that HCV is not easily transmitted through unprotected sexual intercourse and with observations showing the absence of HCV transmission among 30 heterosexual couples – discordant for HIV and HCV – followed up for a median period of 44 months in Edinburgh.³⁷

Prisoners

HCV prevalence among 536 injector and 899 non-injector inmates surveyed in five Scottish prisons during 1994-1996 was estimated at 58% and 3.5%, respectively.³⁸ Similarly, 53% of 173 IDUs and 4.0% of 406 non-IDUs surveyed at Shotts prison during 1999-2000 were HCV antibody positive (personal communication: Dr Jennifer Champion, Greater Glasgow NHS

Table 1 Estimates of HCV seroprevalence among different populations surveyed in Scotland

Population	Region	Method	Survey year	N	HCV seroprevalence % (95% CI)	First author (reference)
1. Pregnant women						
Antenatal clinic attendees	Glasgow	VAT of serum specimens	1992	297	1.0 (0.3 - 3.2)	MacLean (5)
Non-IDU & sexual partner of non-IDU	Dumfries	UAT of serum specimens taken for either a routine named or anonymous HIV test	1997	3,498	0.3 (0.2 - 0.6)	Goldberg (6)
Non-IDU & sexual partner of IDU				33	15.0 (5.1 - 31.9)	
IDU				17	41.0 (18.4 - 67.1)	
All childbearing women	Scotland	UAT of dried blood spot specimens from routine neonatal screening	2000	30,259	0.4 (0.3 - 0.5)	Hutchinson (7)
2. Children						
Glasgow	Glasgow	VAT of saliva specimens [‡] , recruitment from a Dental Hospital	2002	70	3.0 (0.4 - 10.3)	Chattopadhyay (8)
Scotland	Scotland	Routine screening of blood donations	1991-2003	3,658,029	0.02 (0.02 - 0.02)	Dow (9)
3. Blood donors						
4. Recipients of blood and blood products						
Haemophiliacs	Edinburgh	UAT of stored serum samples	1980s	78	98.7 (92.1 - 99.9)	Watson (10)
Dialysis patients (adults)	Glasgow	UAT of serum specimens taken for a hepatitis B surface antibody test	1991	483	3.9 (2.2 - 5.7)	McIntyre (11)
5. Other patient groups						
Surgical patients (men aged 16-49 years)	Glasgow	UAT of serum specimens taken for routine testing	1996-1997	2,702	3.8 (3.1 - 4.5)	Thorburn (12)
Liver cancer patients	Edinburgh	Retrospective testing of stored serum specimens	1985-1994	80	30.0 (20.0 - 40.0)	Laydon (13)
6. Healthcare workers						
Staff performing exposure prone procedures	Glasgow	UAT of serum specimens taken for a hepatitis B surface antibody test	1993-1996	2,205	0.2 (0.1 - 0.5)	Thorburn (14)
Other medical staff				6,207	0.3 (0.2 - 0.4)	
Dental staff	West of Scotland	VAT of serum specimens	1998-2000	880	0.1 (0.0 - 0.6)	Roy (15)
7. Genitourinary Medicine Clinic Attendees						
Non-IDU heterosexual males	Scotland	UAT of serum specimens taken for syphilis serology (in Aberdeen, Edinburgh and Glasgow)	1996-1997	4,135	0.8 (0.5 - 1.1)	Goldberg (16)
Non-IDU heterosexual females				3,035	0.3 (0.2 - 0.6)	
Non-IDU homosexual/bisexual males				668	0.6 (0.2 - 1.5)	
IDU males and females				148	48.6 (40.4 - 57.0)	
8. Prisoners						
Non-IDUs	Scotland	VAT of saliva specimens [‡] at prisons: Aberdeen, Barlinnie, Cramton Vale, Lowmoss and Perth	1994-1996	899	3.5 (2.2 - 4.8)	Gore (17)
IDUs				536	58.1 (53.2 - 63.2)	
Non-IDU males	Scotland	VAT of saliva specimens [‡] at Short's prison (a maximum-security, long-stay prison)	1999-2000	406	4.0 (2.0 - 6.1)	Champion (PC)
IDU males				173	53.1 (44.4 - 61.8)	
9. Injecting drug users (IDUs)						
IDUs	Edinburgh/Lothian	UAT of serum specimens taken for a hepatitis B surface antibody test	1983-1984	126	87.3 (81.5 - 93.1)	Gore (18)
IDUs		UAT of serum specimens which tested HIV antibody negative	1980s	33	75.8 (57.4 - 88.3)	Watson (19)
IDUs		UAT of serum specimens taken for a named HIV test	1989-1999	2,335	57.4 (55.4 - 59.4)	Hutchinson (20)
Current and former IDUs		VNT of serum specimens; search of general practice records	2000	108	67.6 (58.8 - 76.4)	Peat (21)
IDUs	Glasgow	UAT of serum specimens which tested hepatitis B antibody positive	1973-1980	73	80.8 (71.8 - 89.9)	Cameron (PC)
IDUs		UAT of serum specimens which tested hepatitis B antibody positive	1984	202	70.8 (64.5 - 77.1)	Cameron (PC)
IDUs		UAT of serum specimens which tested hepatitis B antibody positive	1992-1993	31	74.2 (58.8 - 89.6)	Cameron (PC)
Deceased IDUs		Retrospective testing of post-mortem serum specimens	1985-1992	48	89.6 (80.9 - 98.2)	McGaiden (22)
IDUs		UAT of serum specimens taken for a named HIV test	1990-2000	2,051	72.8 (70.9 - 74.8)	Hutchinson (23)
Current IDUs		VAT of saliva specimens [‡] ; community-wide recruitment approach	1990-1996	1,949	71.8 (69.2 - 74.4)	Taylor (1)
IDUs who had started injecting ≥ 1990		VAT of saliva specimens [‡] ; community-wide recruitment approach	1999	436	53.2 (47.6 - 58.7)	Taylor (PC)
IDUs who had started injecting ≥ 1996		VAT of saliva specimens [‡] ; community-wide recruitment approach	2001-2002	466	57.5 (52.7 - 62.2)	Taylor (PC)
Female street sex workers, who reported IDU		VAT of saliva specimens [‡] at a medical & social work drop-in centre	1999	89	80.6 (69.3 - 92.0)	Taylor (PC)
Current IDUs	Grampian	UAT of serum specimens taken for a named HIV test	1996-1999	661	37.7 (34.0 - 41.4)	Hutchinson (24)
IDUs	Highland	VAT of saliva specimens [‡] ; community-wide recruitment approach	2000-2001	59	54.7 (41.1 - 68.4)	Taylor (PC)
IDUs	Inverclyde	UAT of serum specimens which tested hepatitis B antibody positive	1996-1999	71	40.7 (28.1 - 53.2)	Stevenson (25)
Current** IDUs	Lothian	VAT of saliva specimens [‡] ; community-wide recruitment approach	1997	90	18.4 (9.5 - 27.1)	Taylor (PC)
IDUs (mainly current**)	Tayside	VAT of saliva specimens [‡] ; community-wide recruitment approach	2000	165	27.1 (19.5 - 34.7)	Taylor (PC)
IDUs	Scotland	UAT of serum specimens taken for a named HIV test	1993-1999	851	62.9 (59.6 - 66.1)	Hutchinson (26)
IDUs		UAT of serum specimens taken for a named HIV test	1995-2000	2,141	44.2 (42.1 - 46.3)	Lay (27)

UAT Unlinked anonymous testing; VAT Voluntary anonymous testing; VNT Voluntary named testing; PC Personal communication; † ‡ Saliva results adjusted here for 85% ad 90% sensitivity of HCV assay, respectively; * Injected previous 6 months.

Board). The obvious potential for transmission of HCV inside prison was confirmed by the findings of the cohort component of the above Shotts prison study; among inmates who reported ever having injected drugs, the HCV incidence was 12 (95% CI 5-32) per 100 person-years of incarceration.³⁹

Injecting drug users

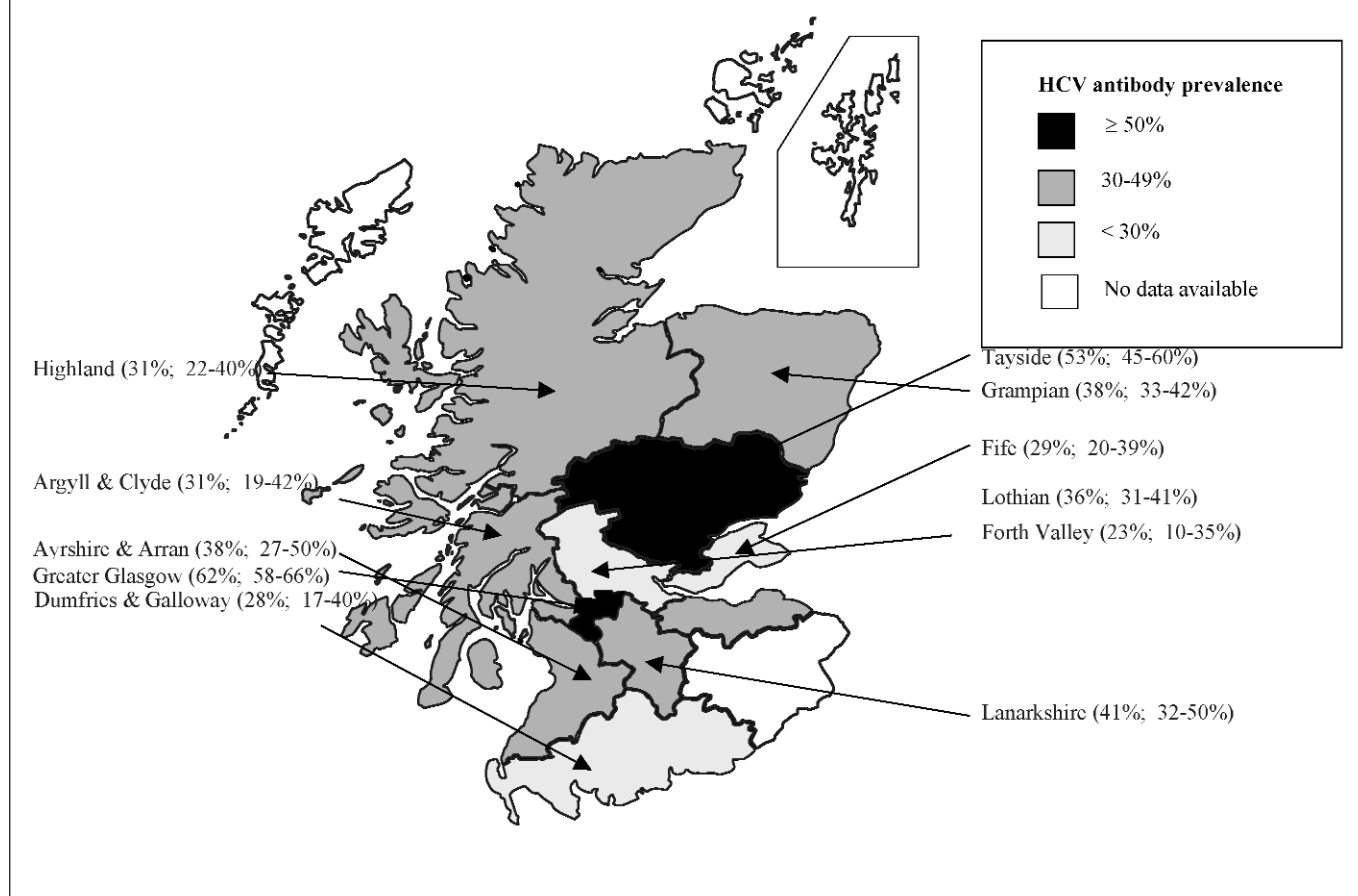
HCV has been circulating among IDUs in Scotland since at least the mid 1970s: 73% of 275 IDUs who had tested hepatitis B surface antibody positive in Glasgow during 1973-1984 (personal communication: Dr Sheila Cameron, Glasgow Regional Virus Laboratory) and 87% of 126 IDUs who had a hepatitis B surface antibody test in Edinburgh during 1984 were HCV antibody positive.⁴⁰ Figure 1 shows the regional differences in HCV prevalence among 2,141 IDUs who had undergone a voluntary confidential HIV test during 1999-2000 in Scotland. The highest HCV prevalence (62%) was detected among IDUs from Glasgow, a city identified as being home to almost 30% of Scotland's current IDU population in 2000 (7,200/25,100).⁴¹

Of almost 2,000 current IDUs recruited to multi-site, community-wide surveys in Glasgow during 1990-1996, HCV prevalence declined from 79% in 1990 to 66% in 1996 ($p=0.001$).⁴²ⁱ These data suggest that the incidence of HCV among IDUs in Glasgow decreased during this period. In the late 1980s and throughout the 1990s in Scotland, interventions

– namely the provision of sterile injecting equipment and methadone maintenance treatment – to reduce needle/syringe sharing and thus the transmission of blood-borne viruses among IDUs,^{43, 44} were implemented and developed. To determine if HCV prevalence among IDUs in Scotland had changed in this era of harm reduction, residual sera from IDUs who had undergone a named HIV antibody test during 1989-2000 were tested for HCV antibodies.⁴⁵ This survey revealed significant reductions in HCV prevalence among IDUs, aged under 25 years, from Glasgow and Lothian between 1990 (Glasgow 91%; Lothian 69%) and 1995 (59%; 31%) and 1997 (43%; 13%), a trend which suggested that a steady decrease in the incidence of HCV had occurred during this period. No further significant reductions in HCV prevalence, however, were found among this group during the late 1990s (Figure 2). In 1990, most IDUs aged less than 25 years would have made their injecting debut prior to the introduction of harm reduction measures; in contrast, the great majority of the corresponding group in the mid to late 1990s would have commenced injecting during the era of harm reduction. These findings demonstrate that existing harm reduction measures, acknowledged as having helped to reduce the spread of HCV among IDUs, are insufficient to bring the epidemic fully under control.

Further, the high HCV prevalence (58% of 466) detected among recently initiated IDUs (i.e. average of 2-3 years' injecting career) recruited to another community-wide survey in

Figure 1 HCV antibody prevalence (%; 95% CI) among 2,141 IDUs in Scotland by health board area, 1999-2000: unlinked anonymous testing of specimens taken for named HIV testing



Glasgow during 2001-2002 suggests that this population's incidence of HCV might be on the increase (personal communication: Professor Avril Taylor, University of Paisley); such a trend would be consistent with the increase in injecting risk behaviours observed between 1991-1994 and 1999.⁴⁶ Modelling work undertaken by the authors estimated that the annual median number of new HCV infections among Glasgow IDUs during 1998-2000 was 700-800⁴⁷; this corresponds to an incidence of 18-30 per 100 susceptible injector-years. It is therefore likely that between 1,000 and 2,000 new HCV infections per year are being acquired annually by IDUs in Scotland.

Number of persons infected with HCV in Scotland

Persons with diagnosed HCV infection

Health Protection Scotland, together with confirmatory HCV testing laboratories, collects epidemiological data on all persons who have been diagnosed HCV antibody positive in Scotland⁴⁸; 18,571 had been diagnosed by December 2004.⁴⁹ Through an initiative involving the linkage of such records with those held on Scotland's death register, it was possible to estimate that approximately 11% of the 18,571 persons had died from causes either related or unrelated to HCV. During 2004, 1,624 HCV antibody positive persons were newly diagnosed, a figure which compares with an annual average of 1,825 during 1998-2003. Among the 12,522 persons (67% of 18,571) for whom risk factor information was available, 90% had injected drugs, 5% had received blood or blood products and 5% reported occupational needlestick injuries, tattoos, body piercings or sexual contact. Of the 18,571, 68% were male, 37% were from Greater Glasgow, 14% Lothian, 12% Grampian, 7% Tayside and 30% from the rest

of Scotland. HCV genotype data were available for 2,778 HCV diagnosed persons (for whom no injecting, blood and other risk factors for HCV infection were reported among 39%, 53%, 5% and 3%, respectively): 47% were genotype 1, 47% genotype 3, 5% genotype 2 and 1% were other genotypes.

Persons with diagnosed HCV infection in clinical care

Data on the numbers of HCV-infected persons in specialist care and treatment will be available once the Scottish Executive-funded National HCV Clinical Database is fully established in 2006. Meanwhile, it is estimated that 5,000-6,000 HCV diagnosed positive persons are, or have been, in specialist care and approximately 1,000 treated with antiviral therapy (personal communication: Dr Toby Delahooke, Scottish HCV Clinical Database Co-ordinator). Reasons for the great majority of HCV diagnoses not having entered specialist care include (i) a PCR negative test result indicating clearance of infection, (ii) failure to attend following referral, (iii) failure to be referred and, probably most commonly, (iv) continuing injecting drug use, rendering individuals ineligible for therapy.

Persons with diagnosed and undiagnosed HCV infection

By 2004, it was estimated that 50,000 persons were living with HCV infection in Scotland (1% of Scotland's population) (Figure 3). This figure was derived by assuming that (a) 16,500 persons diagnosed with HCV were alive in 2004 (see 4.1 above), and (b) 33% of infected cases had been diagnosed with HCV – an approximation, based on data obtained from surveys of Scottish childbearing women during 2000⁵⁰ and over 500 Glasgow IDUs during 2004 (personal communication: Professor Avril Taylor, University of Paisley). The 50,000 estimate was consistent with that derived through models of the IDU-related HCV epidemic in Scotland.⁵⁰

Figure 2 HCV antibody prevalence (%; 95% CI) among young IDUs (aged under 25 years) in Scotland who had a named HIV test, 1989-2000

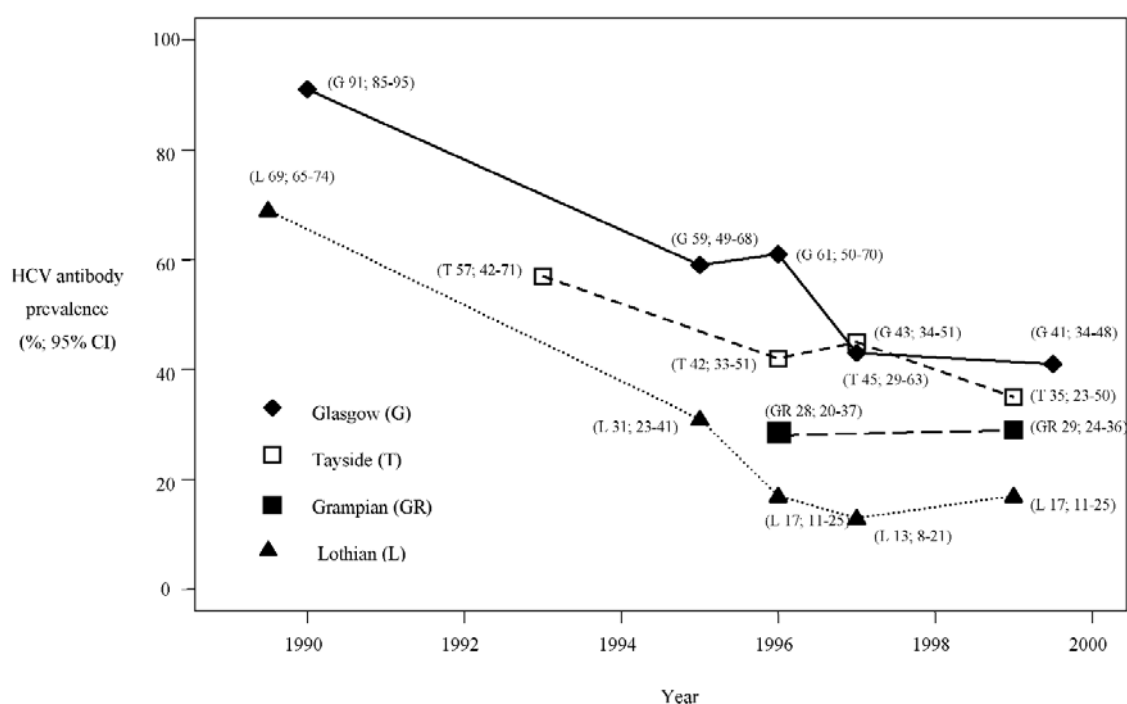
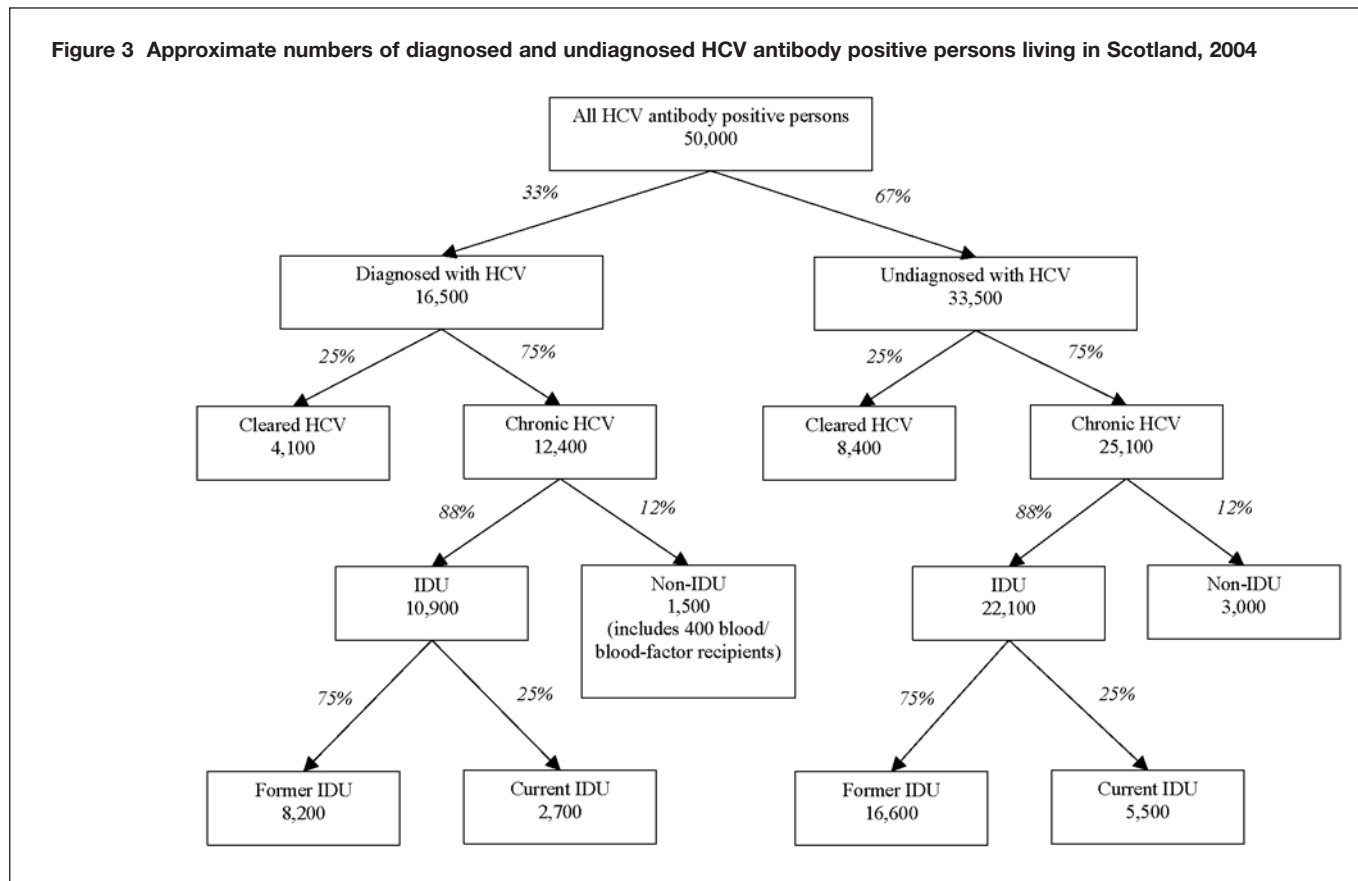


Figure 3 Approximate numbers of diagnosed and undiagnosed HCV antibody positive persons living in Scotland, 2004

Of the 50,000 HCV-infected persons, 37,500 (75%) were estimated to be chronically infected (12,400 diagnosed and 25,100 undiagnosed) and, thus, at risk of developing cirrhosis. A separate modelling exercise, undertaken by the authors, estimated that 24,800 former and 8,200 current IDUs in Scotland had chronic HCV infection in 2004⁵⁰; accordingly, 88% (33,000) of all those chronically infected were IDUs. Assuming that 33% of HCV-infected persons had been diagnosed, then 5,500 current and 16,600 former IDUs, in addition to 3,000 individuals who had never injected, were unaware of their chronic HCV status.

Current and future disease burden of HCV in Scotland

Monitoring the long-term outcomes of chronic HCV infection is challenging as no national surveillance system, involving the registration of HCV-related advanced liver disease, exists in Scotland or indeed elsewhere⁵⁴; a system similar to that for HIV (i.e. AIDS registrations) would be welcome. Linkage of records from the national database on diagnosed HCV-infected persons in Scotland with hospital discharge and death records, however, provided an opportunity to examine the occurrence of decompensated cirrhosis (liver failure) among this group. The number of HCV diagnosed persons admitted to hospital with a first presentation of decompensated cirrhosis in Scotland increased from 171 in 1996-1998 to 209 during 1999-2001, a trend which indicates that the HCV-related disease burden on healthcare resources is growing. Seventy-one per cent of the 514 HCV diagnosed persons who had been hospitalised with decompensated cirrhosis in Scotland during 1991-2001 were identified as having an alcohol problem. The authors estimate that approximately 1,200 HCV-infected IDUs in Scotland had developed liver failure during the years up to 2004; this figure was predicted to increase to 3,200 by 2020.⁵⁰

Assuming the continuation of current rates of antiviral therapy administration, the number of HCV-infected IDUs developing decompensated cirrhosis in Scotland each year is estimated to approximately double from 80 in 2000 to 150 in 2020.⁵⁰ Modelling initiatives in other countries have predicted similar rises in serious HCV-related outcomes.^{51, 52, 53, 54}

Of the 33,000 chronically infected IDUs living in Scotland during 2004 (see 4.3 above), it was estimated that 22,800, 8,400 and 1,800 had mild, moderate and severe (cirrhosis) HCV disease, respectively. UK consensus guidelines recommend that antiviral treatment should be considered for patients who have no contraindications such as ongoing injecting behaviour and have at least moderate liver disease according to histological appearances.¹⁰ It was estimated that 9,000 former IDUs in Scotland were living with either moderate or severe HCV disease in 2004; this number was estimated to double by 2016, unless uptake of antiviral therapy increases substantially.⁵⁰

Discussion

The data above indicate that Scotland faces three principal public health challenges: i) the prevention of HCV among current IDUs, ii) the diagnosis of HCV-infected persons, particularly those who are most in need of therapy to prevent the onset of severe HCV disease, and iii) the current and future provision of adequate resources to ensure that the movement of patients through the diagnostic and clinical care pathway is optimal.

The prevention of HCV among IDUs

Harm reduction measures, namely needle/syringe exchange and methadone maintenance therapy, have had an impact on reducing the incidence of HCV among IDUs in Scotland, but, in many areas, particularly the West of Scotland, rates of infection remain

extremely high. Lack of knowledge among IDUs about HCV and its transmission characteristics is not a major issue but translating such awareness into safer injecting practice clearly is. The Scottish Executive recently introduced two new policies to combat continuing HCV infection among this population: the relaxation of the limit on the number of needles/syringes that can be given to IDUs at any single visit to an exchange and the approval for “other” injecting equipment – filters, spoons and sterile water – to be made available to them. In some areas, such as Glasgow, there has been a movement towards providing needles/syringes in pharmacies and at hostels for the homeless where injecting equipment sharing activity is particularly high. It remains to be seen if these policies and measures have had an impact on HCV transmission. To evaluate the impact of interventions aimed at reducing the spread of HCV among IDUs more effectively, HPS, in association with selected health-boards, plans to introduce a new surveillance system designed to monitor HCV and associated behaviours among IDUs in many parts of the country.

As demonstrated by the 1,000-fold difference between the prevalences of HCV among IDUs and new blood donors, the risk of non-IDUs becoming HCV-infected is relatively low. The additional measures that can be taken to lessen such risk are limited; Scotland’s blood supply is protected through the use of nucleic acid testing of all donors, new policies to reduce further the extremely low risk of infection within the healthcare setting have been implemented⁵⁵ and no interventions have been proven to prevent mother-to-child transmission⁵⁶. It is anticipated that the proposed licensing of tattoo parlours in Scotland will reduce the chances of clients being exposed to contaminated equipment.

The diagnosis of HCV-infected persons, particularly those who are most in need of therapy to prevent the onset of severe disease

As less than 10% of HCV-infected persons develop an acute symptomatic illness, and symptoms, other than non-specific ones, only occur following the development of disease many years later, most are asymptomatic.

Approximately two-thirds of the estimated 37,500 chronically HCV-infected individuals in Scotland remain undiagnosed to date and two-thirds of this group are former IDUs. Persons with moderate hepatitis and no contraindications to antiviral therapy should be offered it¹⁰. Such treatment has only been administered to around 1,000 individuals, and only 5,000-6,000 HCV-infected persons are, or have been, in specialist care. These figures contrast with the estimated 24,800 chronically HCV-infected persons who no longer inject drugs. Since current injecting is a contraindication to therapy and HCV-infected current IDUs are unlikely to have progressed beyond a mild hepatitis disease state, such individuals would not necessarily require any specialist support. Of the 24,800 chronic HCV-infected former IDUs, the majority are (i) either undiagnosed or diagnosed but lost to follow-up and (ii) estimated to have progressed to at least moderate hepatitis; thus, the challenge is to diagnose/“re-diagnose” such persons and then support them in their movement through the clinical care pathway. As former

HCV-infected IDUs are prone to poor social circumstances and health (alcohol consumption is often excessive), this support is vital. A systematic, prioritised approach to diagnosing former IDUs most in need of therapy is required. An excerpt from the Royal College of Physicians of Edinburgh’s Consensus Conference Statement on Hepatitis C summarises the way forward: “A high priority for case-finding should be given to former IDUs, especially those over 40, who are likely to have a stage of disease which would benefit from treatment. Cost-effective methods of identifying this group, through public awareness initiatives in primary care settings, drug treatment services and prisons, should be established. It must be faced that identifying more patients will mean increased demands and costs”.

Diagnosing the 3,000 non-IDU chronically infected persons in Scotland is problematic as most will have no recollection of a risk exposure or will have experienced ones, such as having had a tattoo, which are only marginally discriminating. Offering an HCV test to persons i) with otherwise inexplicably raised liver enzyme (especially ALT) transaminases, ii) who received a blood transfusion pre-1991 or in a resource-poor country, and iii) who had an HCV-infected sexual partner, is advisable.

The current and future provision of adequate resources to ensure that the movement of patients through the diagnostic and clinical care pathway is optimal

If the relatively low current levels of antiviral therapy do not increase in the future, the numbers of HCV-infected persons with severe disease will increase considerably. Reducing the burden of such disease over the next two decades involves increasing the numbers of chronically HCV-infected persons treated but also ensuring that those treated are the ones most at risk of progressing to cirrhosis, liver failure and liver cancer. It is cost-efficient to treat people who have, or (in the absence of liver biopsy evidence) are more likely to have, progressed to a moderate rather than a mild stage of HCV disease. Taking cognisance of NICE’s assessment of the cost-effectiveness of HCV antiviral therapy, sufficient resources are required to optimise patients’ movement through the diagnostic and clinical care pathways.

Acknowledgements

The authors greatly appreciate the work of the following consultant virologists who have supported surveillance and survey activity aimed at furthering our understanding of the epidemiology of hepatitis C in Scotland: Dr Sheila Burns (East of Scotland Specialist Virology Centre, Royal Infirmary of Edinburgh, Edinburgh), Dr Sheila Cameron (West of Scotland Specialist Virology Centre, Gartnavel General Hospital, Glasgow), Dr Paul McIntyre (Department of Medical Microbiology, Ninewells Hospital and Medical School, Dundee) and Dr Pamela Molyneaux (Department of Medical Microbiology, University Medical School, Foresterhill, Aberdeen).

References

- 1 World Health Organisation. Global surveillance and control of hepatitis C. Report of a WHO Consultation organized in collaboration with the Viral Hepatitis Prevention Board, Antwerp, Belgium. *J Viral Hepat* 1999; 6: 35–47.
- 2 Choo QL, Kuo G, Weiner AJ et al. Isolation of a cDNA clone derived from a blood-borne non-A, non-B viral hepatitis genome. *Science* 1989; 244: 359–62.
- 3 Tibbs CJ. Methods of transmission of hepatitis C. *J Viral Hepat* 1995; 2: 113–9.
- 4 Freeman AJ, Dore GJ, Law MG et al. Estimating progression to cirrhosis in chronic hepatitis C virus infection. *Hepatology* 2001; 34: 809–16.
- 5 Lim JK. Natural history of hepatitis C infection: a concise review. *Yale J Biol Med* 2001; 74: 229–37.
- 6 Seeff LB. Natural history of chronic hepatitis C. *Hepatology* 2002; 36: S35–S46.
- 7 Fried MW, Shiffman ML, Reddy KR et al. Peg-interferon alfa-2a plus ribavirin for chronic hepatitis C. *N Engl J Med* 2002; 347: 975–82.
- 8 Manns MP, McHutchison JG, Gordon SC et al. Peginterferon alpha-2b plus ribavirin compared to interferon alpha-2b plus ribavirin for the treatment of chronic hepatitis C: a randomised trial. *Lancet* 2001; 358: 958–65.
- 9 National Institute for Clinical Excellence. Interferon alpha (pegylated and non-pegylated) and ribavirin for the treatment of chronic hepatitis C. (Available at http://www.nice.org.uk/pdf/FAD_HepC.pdf. Accessed 6th April 2006)
- 10 Booth JCL, O'Grady J, Neuberger J, on behalf of the Royal College of Physicians of London and the British Society of Gastroenterology. Clinical guidelines on the management of hepatitis C. *Gut* 2001; 49 (Suppl. 1): 11–21.
- 11 Chisholm M. Member's Debate on Hepatitis C, 30th June. Scottish Parliament, Edinburgh 2004.
- 12 Codere G, Shaw L, Goldberg D. Surveillance of known hepatitis C antibody positive cases in Scotland: results to 31 December 2003. *SCIEH Weekly Report* 2004; 38 (26): 150–5.
- 13 Health Protection Agency, SCIEH, National Public Health Service for Wales, CDSC Northern Ireland, CRDHB, and the UASSG. Shooting Up; Infections among injecting drug users in the United Kingdom 2003. London: Health Protection Agency, October 2004.
- 14 Hutchinson SJ, Goldberg DJ, King M et al. Hepatitis C virus among childbearing women in Scotland: prevalence, deprivation, and diagnosis. *Gut* 2004; 53: 593–8.
- 15 Ades AE, Parker S, Walker J et al. HCV prevalence in pregnant women in the UK. *Epidemiol Infect* 2000; 125: 399–405.
- 16 European Paediatric HCV Network, Pembrey L, Newell M-L, Tovo P-A. Antenatal hepatitis C virus screening and management of infected women and their children: policies in Europe. *Eur J Pediatr* 1999; 158: 842–6.
- 17 Bohman VR, Stettler RW, Little BB et al. Seroprevalence and risk factors for hepatitis C virus antibody in pregnant women. *Obstet Gynecol* 1992; 80: 609–13.
- 18 Leikin EL, Reinius JF, Schmel E et al. Epidemiologic predictors of hepatitis C virus infection in pregnant women. *Obstet Gynecol* 1994; 84: 529–34.
- 19 Silverman NS, Snyder M, Hodinka RL et al. Detection of hepatitis C virus antibodies and specific hepatitis C virus ribonucleic acid sequences in cord bloods from a heterogeneous prenatal population. *Am J Obstet Gynecol* 1995; 173: 1396–400.
- 20 Garner JJ, Gaughwin M, Dodding J et al. Prevalence of hepatitis C infection in pregnant women in South Australia. *MJA* 1997; 166: 470–2.
- 21 Goldberg D, McIntyre PG, Smith R et al. Hepatitis C virus among high and low risk pregnant women in Dundee: unlinked anonymous testing. *BJOG* 2001; 108: 365–70.
- 22 Chatzipantazi P, Roy KM, Cameron SO et al. The feasibility and acceptability of collecting oral fluid from healthy children for anti-HCV testing. *Arch Dis Child* 2004; 89: 185–7.
- 23 Dow BC. Surveillance of blood-borne infections in donated blood, Scotland 2003. *HPS Weekly Report* 2005; 39 (3): 21–2.
- 24 Crawford RJ, Gillon J, Yap PL et al. Prevalence and epidemiological characteristics of hepatitis C in Scottish blood donors. *Transfus Med* 1994; 4: 121–4.
- 25 Health Protection Agency. Surveillance of viral infections in donated blood, England and Wales: 2003. *CDR Weekly* 2004; 14 (44).
- 26 Zou S, Notari EP 4th, Stramer SL, Wahab F, Musavi F, Dodd RY; ARCNET Research Group. Patterns of age- and sex-specific prevalence of major blood-borne infections in United States blood donors, 1995 to 2002: American Red Cross blood donor study. *Transfusion* 2004; 44: 1640–7.
- 27 Watson HG, Ludlam CA, Rebus S et al. Use of several second generation serological assays to determine the true prevalence of hepatitis C infection in haemophiliacs treated with non-virus inactivated factor VIII and XI concentrates. *Br J Haemat* 1992; 80: 514–8.
- 28 Lowe GD. Haemophilia, blood products and HIV infection. *Scott Med J* 1987; 32: 109–11.
- 29 McIntyre PG, McCrudden EA, Dow BC et al. Hepatitis C virus infection in renal dialysis patients in Glasgow. *Nephrol Dial Transplant* 1994; 9: 291–5.
- 30 Thorburn D, Roy K, Cameron SO, Johnston J et al. Risk of hepatitis C virus transmission from patients to surgeons: model based on an unlinked anonymous study of hepatitis C virus prevalence in hospital patients in Glasgow. *Gut* 2003; 52: 1333–8.
- 31 Haydon GH, Jarvis LM, Simmonds P et al. Association between chronic hepatitis C infection and hepatocellular carcinoma in a Scottish population. *Gut* 1997; 40: 128–32.
- 32 Thorburn D, Dundas D, McCrudden EAB et al. A study of hepatitis C prevalence in healthcare workers in the West of Scotland. *Gut* 2001; 48: 116–20.
- 33 Zuckerman J, Clewley G, Griffiths P et al. Prevalence of hepatitis C antibodies in clinical health-care workers. *Lancet* 1994; 343: 1618–20.
- 34 Neal KR, Dorman J, Irving WL. Prevalence of hepatitis C antibodies among healthcare workers of two teaching hospitals. Who is at risk? *BMJ* 1997; 314: 179–80.
- 35 Roy K, Kennedy C, Bagg J et al. Hepatitis C infection among dental personnel in the West of Scotland, UK. *J Hosp Infect* 2003; 55: 73–6.
- 36 Goldberg D, Cameron S, Sharp G et al. Hepatitis C virus among genitourinary clinic attenders in Scotland: unlinked anonymous testing. *Int J STD & AIDS* 2001; 12: 17–21.
- 37 Wyld R, Robertson JR, Brettell RP et al. Absence of hepatitis C virus transmission but frequent transmission of HIV-1 from sexual contact with doubly-infected individuals. *J Infect* 1997; 35: 163–6.
- 38 Gore SM, Bird AG, Cameron SO et al. Prevalence of hepatitis C in prisons: WASH-C surveillance linked to self-reported risk behaviours. *QJ Med* 1999; 92: 25–32.
- 39 Champion JK, Taylor A, Hutchinson S et al. Incidence of hepatitis C virus infection and associated risk factors among Scottish prison inmates: a cohort study. *Am J Epidemiol* 2004; 159: 514–9.
- 40 Gore SM, Brettell RP, Burns SM et al. Pilot study to estimate survivors to 1995 of 1983–84 prevalent hepatitis C infections in Lothian patients who tested positive or negative for hepatitis B surface antigen in 1983–84. *J Infect* 1998; 37: 159–65.
- 41 Bird SM, Goldberg DJ, Hutchinson SJ. Projecting severe sequelae of injection-related hepatitis C virus epidemic in the UK. *J Epidemiol Biostat* 2001; 6: 243–65.
- 42 Taylor A, Goldberg D, Hutchinson S et al. Prevalence of hepatitis C virus infection among injecting drug users in Glasgow 1990–1996: are current harm reduction strategies working? *J Infect* 2000; 40: 1–8.
- 43 Brettell RP. HIV and harm reduction for injecting drug users. *AIDS* 1991; 5: 125–36.
- 44 Stimson G. AIDS and injecting drug use in the United Kingdom 1987–1993: the policy response and the prevention of the epidemic. *Soc Sci Med* 1995; 41: 699–716.
- 45 Hutchinson SJ, McIntyre PG, Molyneaux P et al. Prevalence of hepatitis C among injectors in Scotland 1989–2000: declining trends among young injectors halt in the late 1990s. *Epidemiol Infect* 2002; 128: 473–7.
- 46 Taylor A, Goldberg D, Hutchinson S et al. High risk injecting behaviour among injectors from Glasgow: cross-sectional community wide surveys 1990–1999. *J Epidemiol Community Health* 2001; 55: 766–7.
- 47 Hutchinson SJ, Bird SM, Taylor A et al. Modelling the spread of hepatitis C virus infection among injecting drug users in Glasgow: implications for prevention. *Int J Drug Policy* (in press)
- 48 Shaw L, Taylor A, Roy KM et al. Establishment of a database of a diagnosed HCV-infected persons in Scotland. *Commun Dis Public Health* 2003; 6: 305–10.
- 49 Codere G, McLeod A, Shaw L et al. Surveillance of known hepatitis C antibody positive cases in Scotland: Results to 30 June 2005. *HPS Weekly Report* 2005; 39 (2005/50): 278–82.
- 50 Hutchinson SJ, Bird SM, Goldberg DJ. Modelling the current and future disease burden of hepatitis C among injection drug users in Scotland. *Hepatology* 2005; 42: 711–23.
- 51 Wong JB, McQuillan GM, McHutchison JG et al. Estimating future hepatitis C morbidity, mortality, and costs in the United States. *Am J Public Health* 2000; 90: 1562–9.
- 52 Davis GL, Albright JE, Cook SF et al. Projecting future complications of chronic hepatitis C in the United States. *Liver Transpl* 2003; 9: 331–338.
- 53 Deuffic-Burban S, Wong JB, Valleron A-J et al. Poinard T. Comparing the public health burden of chronic hepatitis C and HIV infection in France. *J Hepatology* 2004; 40: 319–326.
- 54 Sagmeister M, Renner EL, Mullhaupt B et al. Simulation of hepatitis C based on a mandatory reporting system. *Eur J Gastroenterol & Hepatol* 2002; 14: 25–34.
- 55 Scottish Executive Health Department Letter 2002 (75). Hepatitis C Infected Health Care Workers. (Available at http://www.show.scot.nhs.uk/sehd/mels/HDL2002_75.pdf. Accessed 6th April 2006)
- 56 Hay JE. Viral Hepatitis in Pregnancy. *Viral Hepatitis Reviews* 2000; 6: 205–15.
- 57 MacLean AB, Cameron S, Follett EAC. Prevalence of hepatitis B and C viruses and human immunodeficiency virus infections in women of reproductive age. *BJOG and Gynaecology* 1993; 100: 702–3.
- 58 Peat M, Budd J, Burns SM, Robertson R. Audit of bloodborne virus infections in injecting drug users in general practice. *Commun Dis Public Health* 2000; 3: 244–6.
- 59 McCrudden EAB, Hillan KJ, McKay IC et al. Hepatitis virus infection and liver disease in injecting drug users who died suddenly. *J Clin Pathol* 1996; 552–5.
- 60 Stevenson J, Tannahill M, Biggs V on behalf of the outbreak control team. An outbreak of acute hepatitis B infection among injecting drug users in Inverclyde, Scotland. *Commun Dis Public Health* 2001; 4: 60–3.
- 61 Hay G, McKeganey N, Hutchinson SJ, on behalf of the project team. Estimating the national and local prevalence of problem drug misuse in Scotland. Edinburgh: ISD, 2001.