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ORIGINAL RESEARCH

Modeling the fiscal costs and benefits of alternative treatment strategies in the United Kingdom for chronic hepatitis C

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ABSTRACT

Background: Hepatitis C (HCV) infection causes substantial direct health costs, but also impacts broader societal and governmental costs, such as tax revenue and social protection benefits. This study investigated the broader fiscal costs and benefits of curative interventions for chronic Hepatitis C (CHC) that allow individuals to avoid long-term HCV attributed health conditions.

Methods: A prospective cohort model, assessing the long-term fiscal consequences of policy decisions, was developed for HCV infected individuals, following the generational accounting analytic framework that combines age-specific lifetime gross taxes paid and governmental transfers received (i.e. healthcare and social support costs). The analysis assessed the burden of a theoretical cohort of untreated HCV infected patients with the alternative of treating these patients with a highly efficacious curative intervention (ledipasvir/sofosbuvir [LDV/SOF]). It also compared treating patients at all fibrosis stages (Stages F0–F4) compared to late treatment (Stage F4).

Results: Based on projected lifetime work activity and taxes paid, the treated cohort paid an additional £5,900 per patient compared to the untreated cohort. Lifetime government disability costs of £97,555 and £125,359 per patient for treated cohort vs no treatment cohort were estimated, respectively. Lifetime direct healthcare costs in the treated cohort were £32,235, compared to non-treated cohort of £26,424, with an incremental healthcare costs increase of £5,901 per patient. The benefit cost ratio (BCR) of total government benefits and savings relative to government treatment costs (including LDV/SOF) ranged from 1.8–5.6. Treating patients early resulted in 77% less disability costs, 43% lower healthcare costs, and 33% higher tax revenue.

Conclusion: The ability to cure Hepatitis C offers considerable fiscal benefits beyond direct medical costs and savings attributed to reduced disability costs, public allowances, and improved tax revenue. Changes in parameters, such as productivity, wage growth, and tax rates, can influence the conclusions described here.

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Introduction

Hepatitis C infection is a global public health issue, and one of the main causes of chronic liver disease worldwide (with the global prevalence estimated to be >185 million (2.8%))¹. The disease is often asymptomatic in the acute phase, and typically progresses slowly, with 15–45% of infections spontaneously resolving². The major disease burden comes from chronic infections (55–85%), potentially resulting in the development of significant liver disease, including cirrhosis and liver cancer². Low rates of early diagnosis due to the asymptomatic nature of this blood-borne virus often mean diagnosis occurs at more advanced stages, frequently decades after infection². The World Health Organization (WHO) report worldwide deaths due to the hepatitis C virus (HCV) as 399,000 per year; it is, however, suspected that the actual number may be much higher due to under-diagnosis².

Estimates in the UK suggest ~214,000 individuals (0.6%) are chronically infected with HCV, with >90% of infections being genotype 1 or 3³. While it is recognized that both hospital episode statistics and deaths attributed to HCV are under-estimated, hospital admissions from HCV-related end stage liver disease (ESLD) and hepatocellular carcinoma (HCC) have nearly tripled in the UK and deaths more than doubled over the last decade (2003–2013)³. This data highlights a growing burden from HCV, even with a reduced incidence, as patients infected decades ago reach the later stages of the disease, putting a substantial strain on the healthcare system⁴.

Highly efficacious and well-tolerated treatments have become available in recent years; however, many governments and healthcare providers have been hesitant to fully roll-out such advances to their full patient populations due to fears related to potential short-term cost impact and

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📎 Supplemental data for this article can be accessed [here](#).

doubts about the longer-term cost-effectiveness of using these relatively expensive therapies. Previous analyses have largely been based on the direct healthcare costs of treatments and of progressive liver disease, but have generally not encompassed wider societal and governmental costs involved in treating or not treating. Such indirect costs are also a contributing factor to the disease's overall economic burden, as employment rates are lower in HCV patients than in the general population, and overall work productivity among HCV patients is often impaired^{5–7}. A recent study from the RAND group assessed the societal costs that are associated with HCV in the UK, and estimated an annual productivity loss of £192 million pounds for 2015⁸. Younossi *et al.*⁹ showed that these losses can be mitigated by curative interventions. They calculated annual work productivity losses among treated and untreated HCV patients in the UK, and found a 17.9% improvement in work productivity in patients treated with LDV/SOF-based regimens, resulting in cost savings of €26 million annually in the UK⁹.

Methods and data

In the context of healthcare resource allocation decisions, it is important to understand the discrete public investment in HCV therapies within a single cohort to assess how investments influence future government cash flows based on gross tax transfers and spending on public benefit. The objective of this analysis was to expand on prior research, explore the fiscal costs (i.e. lost tax revenue and spending on social benefit programs) and benefits (i.e. transfers attributed to HCV related morbidity and mortality in the UK, based on a modified generational account framework) of HCV curative therapies^{10,11}. Specifically, we will analyze HCV curative treatment compared to no treatment to estimate the magnitude of fiscal benefit for informing a broad range of public sector policy-makers regarding the cross-sectorial impact of HCV and investments in curative therapies. The analysis focuses on the average “per person” cost, which will enable local decision-makers to apply these findings to estimate budgetary impact and cost consequences.

The primary analysis was to compare fiscal costs and benefits of HCV with LDV/SOF vs no treatment for an average 40-year-old non-cirrhotic patient infected with HCV genotype 1. A second analysis of early use of LDV/SOF was performed to understand how early therapeutic intervention (i.e. treating non-cirrhotic (F0–F3) HCV patients at early disease stages) vs treating patients at later disease stages influences fiscal costs and benefits for government.

A single-cohort health-state Markov model was used to reflect the natural history of HCV. The Markov model used for performing the fiscal analysis was the same model employed for the UK cost-effectiveness analysis (CEA) evaluated by the National Institute for Health and Care Excellence (NICE) as part of the LDV/SOF technology appraisal (TA363), and has been previously described¹². Sustained viral response of 97% with LDV/SOF was based on the pivotal efficacy studies^{13,14}. The original cost-effectiveness model captured the direct healthcare costs of the different

HCV health states. Specifically, the CEA model estimated the lifetime direct medical costs of a single-cohort of HCV infected patients. HCV patients entered the model with a certain genotype (e.g. Genotype 1), at a certain age (e.g. age 40), and either as non-cirrhotic or cirrhotic. Subsequently, patients may progress to one of the following stages: (1) Sustained viral response (SVR); (2) cirrhosis with or without SVR; (3) decompensated cirrhosis; (4) hepatocellular carcinoma; (5) liver transplant; (6) post-liver transplant; or (6) death (HCV attributable or all-cause). The transition probabilities between health states are provided in Supplementary Appendix 1. Each of the above disease states were associated with direct medical costs.

For each HCV health state in the LDV/SOF cost-effectiveness model, a specific productivity profile that corresponds to certain labor market outcomes, tax paying potential, and receipt of social benefits were assigned. In this way, the LDV/SOF cost-effectiveness model was adjusted to capture lost productivity attributed to HCV morbidity and the resulting lost tax revenue. Lost productivity was attributed both to morbidity in more severe health states that impair work activity and decreased life expectancy. Furthermore, the CEA model was modified to capture social benefit provided by the government for people that are unable to live and work normally once they reach a severe HCV health state. The methods used for this analysis originated from the traditional human capital theory and the theory of generational accounting¹⁰, originally developed to explore the cross-sectorial and inter-temporal impact of government policy on the value of current and future taxes a person is likely to pay net of transfer payments over their lifetime.

Direct and indirect (i.e. VAT) taxes paid by individuals were based on earnings and consumable spending, respectively; therefore, the starting point for estimating tax revenue was derived from age-specific earnings profiles¹⁵. There are several peculiarities that relate to taxable incomes for HCV individuals and taxes paid. Individuals with HCV often earn lower wages than non-HCV individuals, have lower labour-force participation rates, and face higher unemployment rates; hence, adjustments to average population earnings were necessary. To reflect the income of a cohort with HCV patients, average general populations' labour market outcomes¹⁶ were adjusted based on observational studies from the literature which compared the labor market outcome of HCV patients to that of the general population^{5–7,17,18}. Furthermore, published reductions in labor force participation rates were applied to late stages of HCV infection. The adjusted earnings data used in this analysis to calculate direct and indirect tax are illustrated in Table 1. Average old-age pensions and benefits were also derived from national statistical sources¹⁹. To estimate the direct and indirect (i.e. VAT) taxes for people with HCV in the UK, direct taxes were linked to earnings and indirect taxes were linked to the age-specific consumption attributed to disposable income. The average direct tax paid on wages in the UK is 18.9%, whereas the average consumption or indirect tax rate applied to disposable income is 18.8%²⁰. Thus, the total tax burden in this analysis was ~39%, which excludes national insurance contributions.

Table 1. Earnings, labor market outcomes for HCV, social protection costs, and healthcare costs by health state.

Health states	Asymptomatic stages		Early stages		Advanced stages	
	Non-cirrhotic with/without SVR		Compensated cirrhosis	Decompensated cirrhosis	Hepatocellular carcinoma	Liver transplant
Labor market outcome of HCV patients by health state						
Annual earnings by age	HCV pts. have lower earnings (~9% less) and labor force participation rates compared to the general population (~23% less)		Similar labor force participation rates with non-cirrhotic patients	24% less labor force participation rates compared to non-cirrhotic	43% less labor force participation rates compared to non-cirrhotic	19% less labor force participation rates compared to non-cirrhotic in the follow-up period
Age 40–49	£15,371		£15,371	£11,656	£8,095	£12,579
Age 50–59	£14,541		£14,541	£11,027	£7,658	£11,899
Age 60–68	£12,567		£12,567	£9,530	£6,619	£10,284
Age 68+	Old-age pensions (25%): £3,562; Benefits (65%): £9,261; Other sources of taxable income: £1,425					
Frequency and annual values of social protection benefits/disability costs						
Benefits	Weekly value	Frequency	Frequency	Frequency	Frequency	Frequency
Job seeker allowance	£3,406	5%	9%	9%	9%	9%
Employment support (13 weeks)	£851	5%	82%	82%	82%	82%
Employment support (after 13 weeks)	£4,123	5%	82%	82%	82%	82%
Incapacity benefit/income support	£4,890	5%	27%	100%	100%	100%
Disability living allowance	£4,819	5%	45%	45%	45%	45%
housing benefit	£5,129	5%	64%	64%	64%	64%
Council tax support	£3,900	5%	36%	36%	36%	36%
Income support	£3,010	5%	36%	36%	36%	36%
Child benefit	£1,076	5%	18%	18%	18%	18%
Carer allowance	£3,229	5%	9%	9%	9%	9%
Personal Independence payment	£3,572	5%	9%	9%	9%	9%
Total costs	£1,904		£14,451	£18,021	£18,021	£18,021
Healthcare costs per disease state		£245–£363	£1,540	£12,339	£10,994	Year 1 £83,000 Year 2 £27,000 Year 3 £4,000

Individuals with advanced HCV states can become dependent on government social support programs as their health condition restricts their ability to work and live normally. The proportions of persons receiving social benefits in early and late stage disease were obtained from survey data for the UK²¹. The cost for each social benefit received by people with HCV was identified in the Department for Work & Pensions, Benefit and Pension Rates report²². The reported frequency of benefits received amongst HCV-infected individuals was used to derive annual costs based on HCV health states. The estimated annual costs of social benefits for early stages (i.e. compensated cirrhosis) were estimated at ~£14,451 annually, whereas more advanced stages were associated with annual costs of £18,021. For non-cirrhotic HCV patients, an annual cost of £1,904 was assumed, which is similar to the average annual cost of social benefits received by the general population in the UK. The annual social benefit costs were applied at the various HCV health states, based on the proportion of people in each stage.

Based on an assumed starting age of 40, a cohort of $n = 10,000$ HCV patients entered the Markov model either as non-cirrhotic (F0–F3) or as cirrhotic (F4). Patients either receive treatment with LDV/SOF or no treatment. For each Markov cycle the HCV cohort progressed through the model, based on the transition probabilities to different health states. Based on the numbers of subjects in each health state, the annual health state-specific fiscal costs and benefits of HCV and HCV treatment were estimated in terms of annual gross tax revenue paid to the government, annual healthcare costs and social benefits, and disability costs per year paid by the government to HCV patients. In turn, the model calculated, for the lifetime of the cohort, the cumulative fiscal costs and benefits, discounted at 3.5%, of HCV and HCV treatments (Equations 1–3). Future government costs and benefits were discounted at a rate of 3.5%, in line with the UK Treasury Green Book recommendations for assessing public funding of projects²³. In addition to the costs described previously, old-age pension costs were calculated based on the average annual old-age pension and benefits in the UK multiplied by the number of patients surviving each year beyond the expected average age of retirement in the UK (i.e. 68 years of age).

$$\text{Gross tax}_{\text{lifetime}} = m \times \sum n_s * \text{Tax} * Y_s^i \quad (1)$$

$$\text{Social protection costs}_{\text{lifetime}} = m * \sum n_s * D_s \quad (2)$$

$$\text{Healthcare costs}_{\text{lifetime}} = m * \sum n_s * HC_s \quad (3)$$

where: m = number of Markov cycles; n_s = number of patients in Markov-state s ; Y = annual age-specific earnings (for age i) in Markov-state s ; Tax = Average direct and indirect Tax burden; D_s = Annual social benefit transfers/disability costs in Markov-state s ; and HC_s = Annual healthcare costs in Markov-state s .

A sensitivity analysis was performed in the primary analysis comparing fiscal costs and benefits of HCV with LDV/SOF vs no treatment. The following parameters were varied

to test the sensitivity of the primary analysis: Discount rate = 0–4%; Treatment cost = $\pm 20\%$; disability cost = $\pm 20\%$; wage productivity = $\pm 20\%$; Earnings = $\pm 20\%$.

Two different benefit cost ratios (BCR) were derived as follows using absolute values:

$$\text{BCR1} = \frac{[no \text{ Tx} + iD + iTax]}{\text{LDV : SOF costs}}$$

$$\text{BCR2} = \frac{[iD + iTax]}{iHealth \text{ costs}}$$

where $No \text{ Tx}$ = usual care treatment costs; iD = incremental tax revenue; $iTax$ = incremental tax revenue; and $iHealth \text{ costs}$ = the incremental cost increase switching from no treatment to LDV/SOF.

Results

Treatment vs no treatment

The disaggregated outputs from the HCV fiscal model have been independently presented to illustrate the impact of treatment vs no treatment scenarios on different government budgets. The costs of LDV/SOF and usual care were presented over the remaining lifetime of HCV individuals (Table 2). The total healthcare costs of treatment vs no treatment were £32,235 and £26,424, respectively, with a net healthcare cost of £5,901 with LDV/SOF compared to no treatment. Disability costs for treatment vs no treatment were £97,555 and £125,359, respectively, indicating that savings in disability costs with LDV/SOF of –£27,804 can be achieved. These costs are based on the proportions of subjects in different cirrhotic and non-cirrhotic health states and the public costs (non-health) associated with each disease state. A small increase in tax revenue per person of £4,324 is projected in the LDV/SOF treatment group compared to no treatment.

The results of the analysis above were used to derive benefit-cost ratios (BCR) to project economic value in relation to LDV/SOF costs (Table 2). The BCRs were constructed using different combinations of costs to estimate the BCR, based on gross or net investment costs in LDV/SOF. The BCR(a) analysis that includes the gross treatment costs of LDV/SOF generates a ratio of 1.8, indicating that, for each £1 spent, £1.8 in fiscal benefit for government is generated. In contrast, the BCR analysis which considers the net costs of HCV treatment (LDV/SOF - usual care costs) generates a BCR(b) estimate of 5.4, suggesting that £1 spent offers £5.4 in fiscal benefit.

Sensitivity analysis

To assess the sensitivity of the results to the different parameters used, a deterministic, one-way sensitivity analysis of the BCR(a) was explored (Figure 1). The sensitivity analysis results indicate the BCR is most sensitive to the discount rate. Changes in the treatment cost had an influence on the BCR, although in the variations assessed the BCR remained over 1, indicating that additional fiscal benefit was obtained in relation to investment costs in all scenarios tested. Earnings had a minor impact on the BCR findings, which reflects the

observation that curative HCV treatment has limited impact on productivity and future earnings and tax revenues.

Early vs late treatment

Accounting for fiscal costs and benefits, early treatment (any fibrosis stage) offered healthcare cost savings of £24,747 compared to the late treatment (cirrhotic only) option. Furthermore, a net reduction in disability costs of –£119,602 was demonstrated with early intervention compared to late intervention (Table 3). The likely incremental improvement in gross tax revenue from early intervention was estimated at £49,829 over the lifetime of the cohort. Taking into consideration the absolute savings on health costs and disability, as well as future tax revenue gains, and excluding pensions, the net benefit of early intervention is estimated to be £194,178.

Discussion

From a governmental perspective, healthcare interventions that reduce morbidity and increase survival will have both positive and negative fiscal consequences for government. On the one hand, decreases in morbidity and mortality will increase the tax base, as more people are in the labor force generating tax revenues for the government whilst consuming less disease-specific healthcare and social benefits. On the other hand, more survivors are eligible to receive public benefits including healthcare costs, pensions, and other allowances, whilst consuming the healthcare resource required for the intervention, e.g. treatment for chronic Hepatitis C (CHC). In the case of CHC, wider fiscal costs and benefits to government are likely to extend significantly beyond healthcare costs. For instance, people with more

Table 2. Per person disaggregated discounted fiscal costs and benefits of HCV comparing no treatment with LDV/SOF.

Fiscal impact	LDV/SOF treatment	No treatment	Δ (Treatment vs no treatment)
LDV/SOF costs	£30,842	—	£32,235
Usual care costs	£1,483	£26,424	–£26,424
Total Healthcare costs	£32,235 (1)	£26,424 (2)	£5,901 (3)
Disability costs	£97,555	£125,359	–£27,804 (4)
Tax revenue	£205,387	£201,063	£4,324 (5)
State old-age pensions	£115,837	£94,159	£21,678 (6)
(1) LDV/SOF Treatment investment cost per person; (2) Healthcare cost-offsets per person with treatment; (3) Net treatment cost (1) – (2), or net investment cost; (4) Reduced disability/social protection costs due to treatment. Benefit, i.e. cost-savings for the government; (5) Increased tax revenue resulting from treatment. Benefit, i.e. increased tax revenue for the government; (6) Pension costs increase resulting from increased survival due to treatment. Fiscal cost for the government.			
Benefit Cost ratio (a)	1.8	[(2 + 4 + 5): (1)]. This ratio considers that the investment is only LDV/SOF treatment, which results in preventing usual care costs, leads to increased tax revenue, and prevents disability costs.	
Benefit Cost ratio (b)	5.4	[(4 + 5): (3)]. This ratio considers the benefits of healthcare investment against HCV. Thus, it assumes that healthcare investment is net, i.e. the cost of LDV/SOF is deducted by the averted usual care costs and then compares the net investment in healthcare with the benefits of additional tax and averted disability costs.

Figure 1. One-way sensitivity analysis for the BCR (treatment vs no treatment).

Table 3. Comparison of early vs late LDV/SOF therapy in non-cirrhotic Hep C population in the UK, based on cross-sectorial fiscal impact.

Fiscal impact	Early treatment with LDV/SOF	Late treatment with LDV/SOF	Difference Early vs late	Interpretation
Healthcare costs	£32,235	£56,982	–£24,747	Early treatment results in less healthcare costs
Disability costs	£63,638	£183,240	–£119,602	Early treatment prevents disability costs
Tax revenue	£103,939	£54,110	£49,829	Early treatment is expected to result in higher tax revenue for the government.

advanced cirrhotic disease are often unable to live normal lifestyles and become increasingly reliant on government social support programs²¹. Furthermore, reduced work activity translates into reduced tax revenue, both through reduced income taxes and lower disposable income, which lowers value added tax due to reduced consumption.

Central and local government have become increasingly aware of the importance of assessing the impacts of interventions on both health and social care, and this has been made even more pressing with the planned devolution of joint health and social budgets to local decision-makers within the UK and potentially elsewhere²⁴. The broader fiscal consequences of poor health in working aged adults on government are not trivial. Cross-sectorial studies in the UK indicated that ill-health in working aged adults reaches £62–76 billion annually²⁵. Of these costs, ~89% (£57–65 billion) were attributable to foregone taxes and unemployment benefits, whereas healthcare spending, the focus of most cost-effectiveness analyses in the UK, represented ~11% of government costs (£5–11 billion)²⁵. The results described here, and more generally applying a fiscal perspective to allocation decisions, can inform local or central government policy-makers about how changes in health will influence spending or savings in other public sectors.

The results described here are specific to the UK, where a generous welfare state exists, supported by high taxation rates. We might expect similar results would be obtained in other countries with comparable social welfare benefits, epidemiological profiles, and tax rates. However, without conducting the specific analyses for each country, caution should be exercised in directly translating these findings to other markets.

To translate spending on LDV/SOF into public benefit, we have generated two different cost ratios to demonstrate the fiscal benefit achievable in relation to each £1 of spending. The choice of which BCR to favor depends on whether one believes the analysis should consider only the treatment costs of the intervention arm (LDV/SOF in this case), giving a BCR of 1.8 or the incremental spending on healthcare costs, i.e. calculated by subtracting costs associated with “no treatment” from the costs associated with the intervention, giving a BCR of 5.4 in this case. In both scenarios, the fiscal benefit to government realized by treating patients with chronic HCV infection exceeds the fiscal costs.

These results underline the need to think more broadly about treatment benefits in relation to curative therapy costs—a sentiment also reflected by the World Health Organization consortium advocating the need to understand the broader economic benefits of vaccination²⁶. Given that the government is the principal funder of healthcare in tax-based funding models such as in the UK, it is imperative that the full fiscal costs and benefits to the government of alternative treatment strategies are outlined. Benefits can also extend to private enterprise. Previous studies of large employers highlighted that HCV-infected individuals had increased sick leave, short- and long-term disability, and workers’ compensation with annual indirect costs of US\$490 per year¹⁷. Furthermore, a recent survey of privately insured people with HCV noted the impact of the progressive nature

of HCV infection on annual indirect work-loss, reporting costs for non-cirrhosis, compensated cirrhosis, and ESLD of US\$742, US\$1,449, and US\$3,775 compared to non-HCV-infected individuals, respectively²⁷.

In the analysis described here we also illustrated the increased fiscal benefit that can be gained from early intervention (treating all patients, regardless of liver fibrosis level) vs delayed treatment (treatment commenced only when patients develop cirrhosis). Specifically, savings in healthcare (£24,747 per patient) and disability costs (£119,602 per patient) can be achieved from early intervention, with additional tax revenue gains of £49,829 per patient also achieved. Taking account of all fiscal costs and benefits, a strategy of treating all patients rather than waiting to commence treatment when patients become cirrhotic is estimated to deliver a fiscal benefit to government of ~£194,178 per patient (net) over the patient’s lifetime. While there may be pressure to delay therapy for non-cirrhotic people due to concerns around affordability, once disease progression occurs a proportion of people will progress to more severe health conditions, requiring more intensive healthcare interventions, with increased likelihood of withdrawing from the work force and relying increasingly on social benefits paid for by government.

Several weaknesses need to be taken into consideration in projecting lifetime fiscal costs and benefits, as described here. First, pension costs have not been included in our analysis. The reason being that survival from treatment will lead to higher pension costs in the long-term; however, we do not refuse lifesaving treatment of people simply because they will one day become pensioners. Furthermore, the analysis described here is based on long-term modeled projections, based on current tax rates, employment and wage rates, and growth. Small variations in any of these parameters could influence the conclusions described here. This was demonstrated by the sensitivity analysis, where changes to the discount rate could have an influence on the overall results. Additionally, the amount of social benefits being received by people with HCV that are unable to work was based on a small sample size. Improved estimates for government social benefits costs would enhance our understanding of fiscal transfer benefits received in more severe HCV states. The analysis described here does not take into consideration the potential heterogeneity of the HCV cohort. We have applied a simplifying assumption of an average HCV cohort based on reduced wage rates and estimates on government transfer benefits received. Variation in these parameters could influence the results. Furthermore, the results described here apply a monetization of health benefits from the government perspective, based on changes in tax receipts and transfer payments. Because no value is assigned to the value of being healthy from the perspective of individuals and society, the results here are an under-estimate of the overall benefits attributed to HCV elimination. Due to the absence of data on no treatment, the transition probabilities for no treatment are derived from the era of peginterferon therapy, which was the dominant strategy for many years. This would suggest that we over-estimate the effects of no

treatment; hence, the incremental fiscal consequences described here are likely conservative.

Funding decisions in healthcare are multi-factorial, and are taken at many different levels of government and within health systems. The analysis described here is provocative, because it assigns future tax value to interventions made by public health systems. Even in those countries that aspire to allocate healthcare resources using welfare principles, there is a need for information regarding broader economic consequences of technologies, and there is a fiscal reality that needs to be taken into consideration. For example, the National Audit Office in the UK applies a similar method to the one described here for assessing healthcare interventions. Furthermore, in light of devolution of care in the UK, there is increasing demand from local policy-makers to understand the consequences of changes in health status.

Conclusions

Applying a fiscal analytic framework to investigate HCV infection and curative treatment reveals the cross-sectorial impact of the condition on different government sectors. We demonstrate here that investing in curative HCV therapy offers a broad range of fiscal benefits for government that includes reduced public spending on social programs and disability, and increases in tax revenue, in addition to cost savings within the health sector. Based on this fiscal analysis, governments can generate fiscal benefits between £1.8–£5.4 for every £1 invested in curative HCV treatment, with an estimated £4,324 increase in gross tax revenue. However, it is worth noting that the fiscal analysis described here remains an under-estimate of the broader economic benefits of curative HCV therapy, as it does not consider the broader macro-economic consequences of people contributing to the economy and the likely multiplier effects achieved through improved health. We also illustrate that early intervention with curative HCV treatment (regardless of fibrosis level) offers improved economic gains compared to late intervention (treating only at F4 fibrosis), resulting in reduced disability and health spending, and generating important improvements in tax revenue. This means that the net financial/fiscal benefits to government of treating all patients with chronic HCV infection exceeds the net fiscal benefits achieved by waiting until patients become cirrhotic before commencing treatment.

Transparency

Declaration of funding

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Declaration of financial/other relationships

The authors disclose no financial interests in the funding organization or the commercial operations of the funding organization. JME peer

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Previous presentation

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