RWD173

Using Data to Develop Precision Medicine Approaches to Public Health Interventions

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INTRODUCTION

Hepatitis C virus (HCV) is a viral infection that affects the liver. It can cause both acute and chronic illness and can be life-threatening. It is spread through contact with infected blood, often through sharing needles or syringes, and disproportionately affects people living in poverty. There are approximately 2,000,000 to 3,500,000 people living with HCV in the US.

HCV can be treated with sofosbuvir, an antiviral drug, in combination with other antiviral agents. Access to HCV treatment is improving but remains limited. The World Health Organization (WHO) estimated in 2019 that of the 58 million people living with HCV infection globally, 21% knew their diagnosis and of those diagnosed with a chronic HCV infection, around 62% had been treated [1]. This highlights a barrier to access of treatment, where many people with HCV are unaware of their infection. Further barriers to access of treatment include poor knowledge around the disease and non-adherence to treatment.

The economic burden of HCV is considerable, with estimates of up to $10 billion annually in the US alone [2].

METHODS

A cost calculator was developed to estimate the burden of HCV within the US, focusing on Louisiana and Florida. These states were selected due to geographic proximity and similar rates of HCV, but with different rates of death associated with HCV. This indicated that there may be other social factors impacting the HCV populations in each state.

The Socially Determined social risk dataset and visualization was used to examine community-level social risk across seven different domains: economic climate, food landscape, housing environment, transportation network, health literacy, digital landscape and social connectedness. The social risk scores are calculated at a geospatial unit represented by a hexagon, where each hexagon is 200 to 400 meters in diameter depending on population density.

Costs and health losses from HCV were sourced from published sofosbuvir cost-effectiveness papers. These were used to estimate the impact on quality-adjusted life years (QALYs), life years and costs of targeted interventions for HCV prevention which could result in a 2% reduction in HCV cases.

For simplicity, data for the treatment of naïve non-cirrhotic genotype 1 HCV was used as a proxy for all HCV. Table 1 details the model inputs.

Table 1: Model inputs

Parameter	Input	Source
QALYs		
Sofosbuvir +SoC	9.16	NICE [3]
Non-SOF +SoC	6.36	
No treatment	4.98	
Costs		
Sofosbuvir +SoC	$68,228	Chhatwal et al. [4]. Table 2 Based on 24% of Sofosbuvir cost
Non-SOF +SoC	$54,052	
No treatment	$16,375	
Life years		
Sofosbuvir +SoC	15.91	NICE [3]
Non-SOF +SoC	11.68	
No treatment	9.36	

Abbreviations: QALYS, quality-adjusted life year; SoC, standard of care; SOF, sofosbuvir.

RESULTS

It was estimated that the current QALY loss from untreated diagnosed HCV is 9,118 and 4,511 QALYs (14,287 and 7,069 life years) for Florida and Louisiana, respectively. The cost (US$) to treat this population was estimated to be approximately $113m and $56m with sofosbuvir ($82m and $41m with non-sofosbuvir treatment). A public health intervention that could reduce new HCV cases by 2% would save society $1.6m and $0.8m, whilst resulting in 122 and 60 additional QALYs and 185 and 92 additional life years, respectively.

Table 2: Model results

QALYs	Florida	Louisiana
SOF vs no treatment	9,118	4,511
2% reduction in HCV	122	60
Costs		
SOF vs no treatment	$113,107,327	$55,964,183
SOF vs non-SOF	$82,185,282	$40,664,317
No treatment	$35,718,103	$17,672,900
2% reduction in HCV	$1,643,706	$813,286
Life years		
SOF vs no treatment	14,287	7,069
SOF vs non-SOF	9,227	4,565
2% reduction in HCV	185	92

Abbreviations: HCV, hepatitis C; SOF, sofosbuvir.

Figure 1: Rates of HCV in the US, per 100,000 [5]

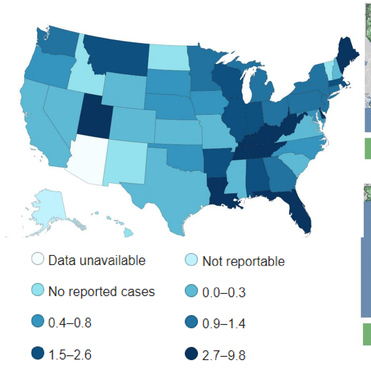
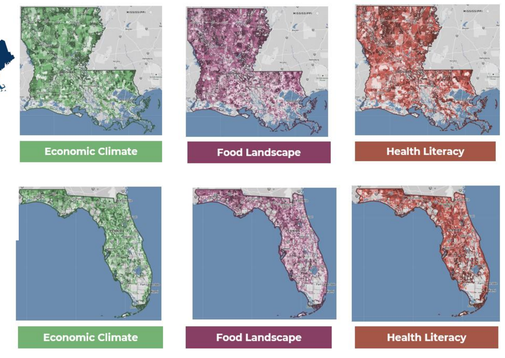


Figure 2: Socially Determined Social Risk Data Visualization



CONCLUSIONS

Granular social risk data, such as those developed by Socially Determined, can directly inform public health policy. Understanding variation in social risk helps to identify opportunities for impact in order to strategically and appropriately execute on public health interventions, such as needle exchange site placement, community engagement approaches, or distribution of education around HCV. Understanding variations in social risk across communities through a data-driven approach can improve outcomes, reduce costs, and drive health equity across the nation.

REFERENCES

1. World Health Organisation. Hepatitis C **2.** Stepanova *et al*. Economic Burden of Hepatitis C. Clinics in Liver Disease. 2017. **3.** NICE. STA: Sofosbuvir-velpatasvir for treating chronic hepatitis C. Committee Papers. **4.** Chhatwal *et al.* Cost-effectiveness and budget impact of hepatitis C virus treatment with Sofosbuvir and Ledipasvir in the US. Annals of Internal Medicine. 2015. **5.** Centers for Disease Control and Prevention. Hepatitis C, Figure 3.3

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