MEDIZINISCHE KLINIK 1

UNIVERSITÄTS KLINIKUM FRANKFURT

# Vereinfachung der HCV-Therapie als Grundlage für Eliminationsstrategien

## München, 17. Juli, 2020

**Stefan Zeuzem**

**Universitätsklinikum Frankfurt a.M.**

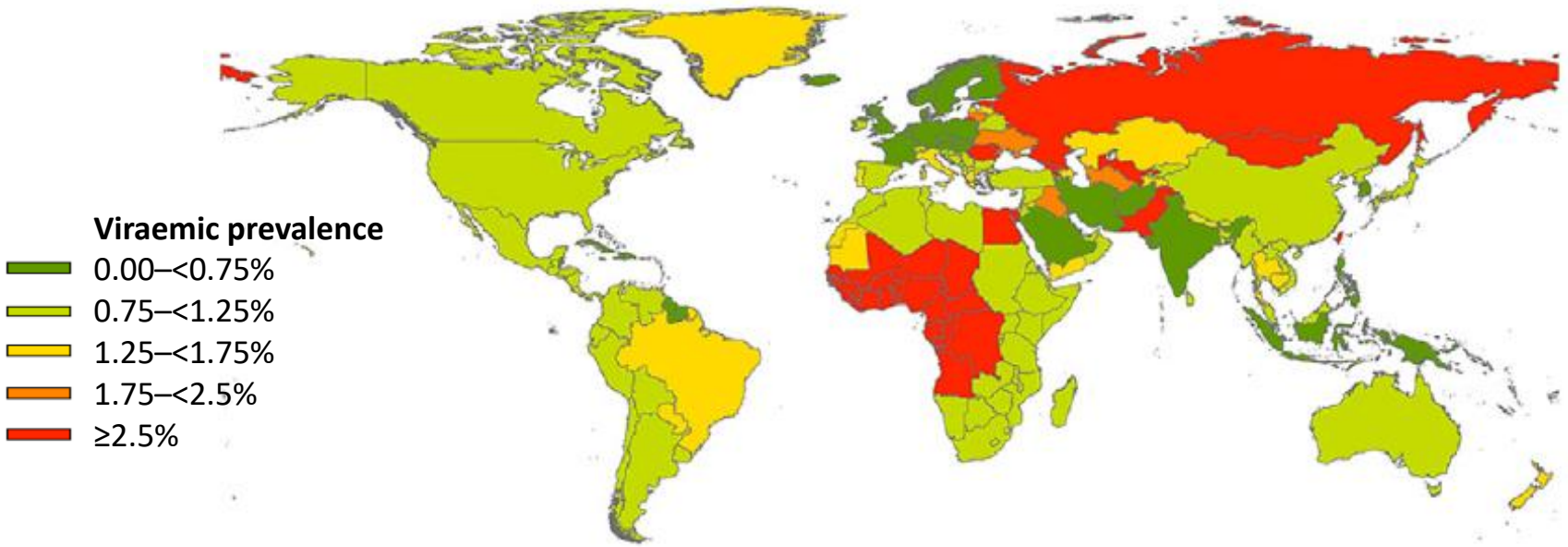
# Disclosures

- Advisory boards: AbbVie, Bristol-Myers Squibb, Gilead Sciences, Janssen, Merck Sharp & Dohme
- Speaker: AbbVie, Gilead Sciences, Merck Sharp & Dohme

# Burden of Disease

# Global burden of HCV

- Estimated that 80 million people are living with chronic HCV worldwide



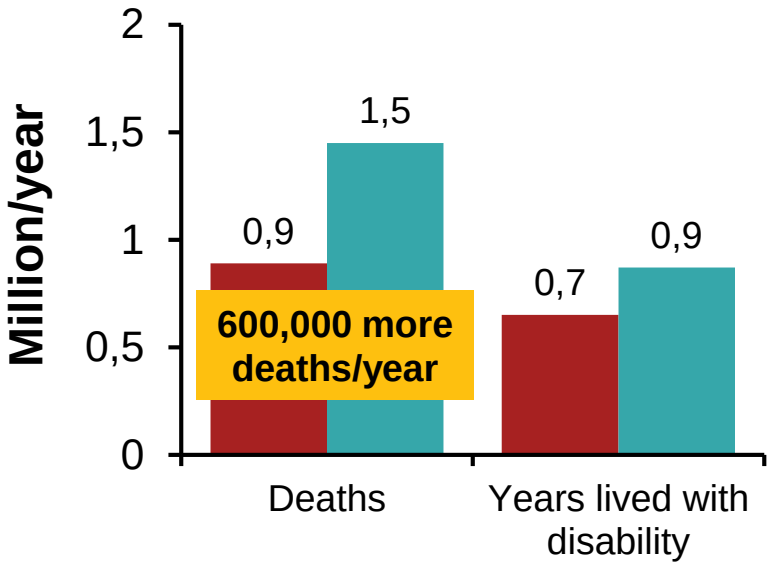

- Annually ~700,000 people die from HCV-related complications such as cirrhosis and hepatocellular carcinoma

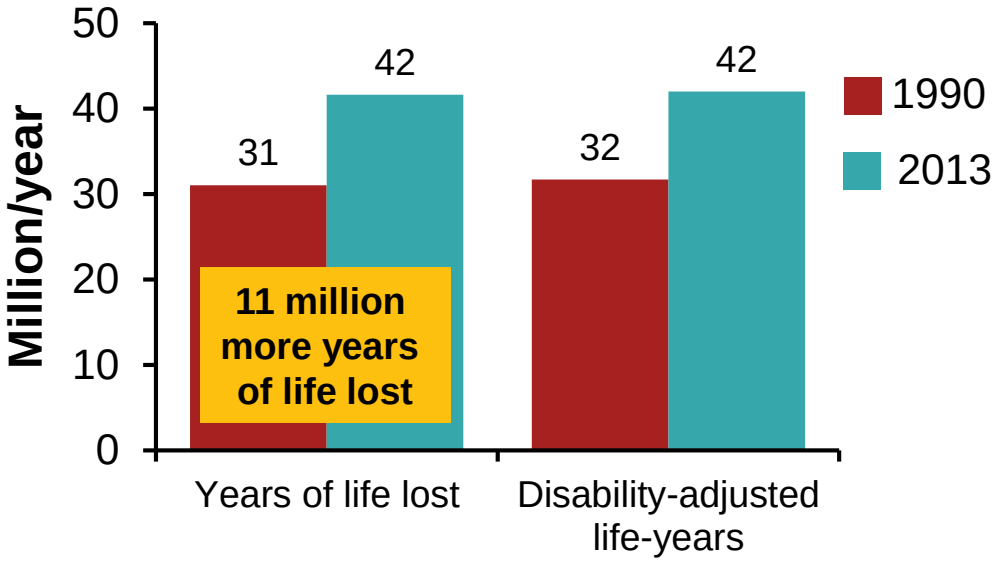
WHO. Global report on access to hepatitis C treatment – focus on overcoming barriers. Available at: http://www.who.int/hepatitis/publications/hep-c-access-report/en/ (Accessed February 2017);
Image taken from Gower J, et al. J Hepatol 2014;61:S45–57

# Global burden of viral hepatitis

- Viral hepatitis is the 7th leading cause of death in the world
  - 1.5 million deaths attributable to viral hepatitis in 2013
- Unlike most communicable diseases, the absolute burden of viral hepatitis continues to increase

**Burden of hepatitis from 1990–2013: data from the Global Burden of Disease study**

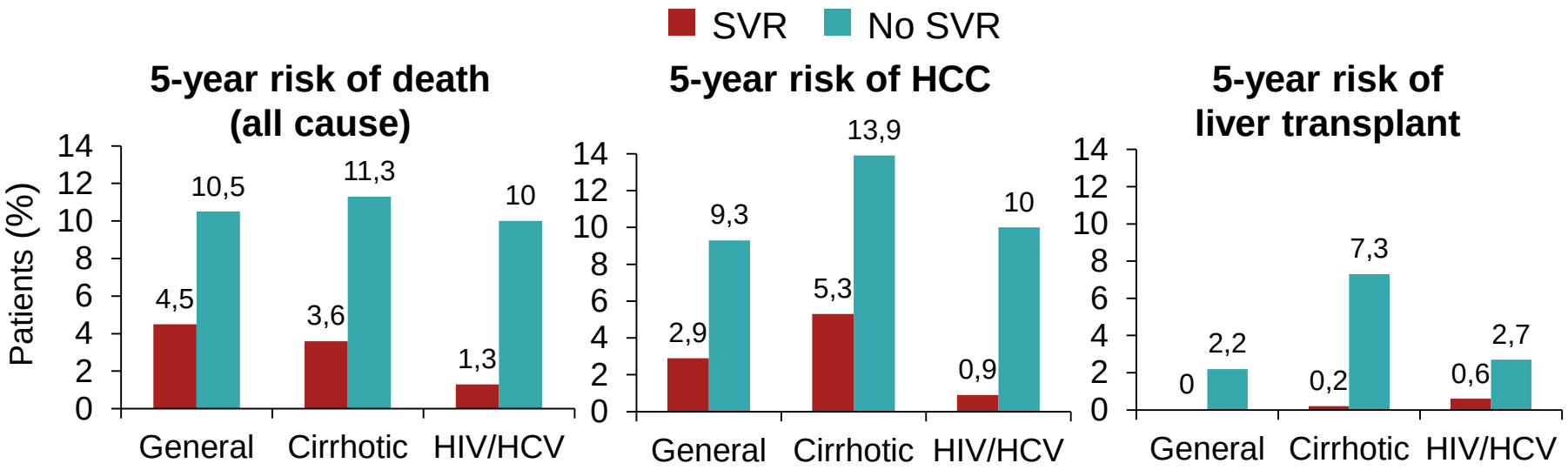



Stanaway JD, et al. Lancet 2016;388:1081–8

# SVR is associated with reduced mortality, HCC and transplant

**Meta-analysis of 129 studies of IFN-based therapy in 34,563 HCV patients**




Achieving SVR was associated with:

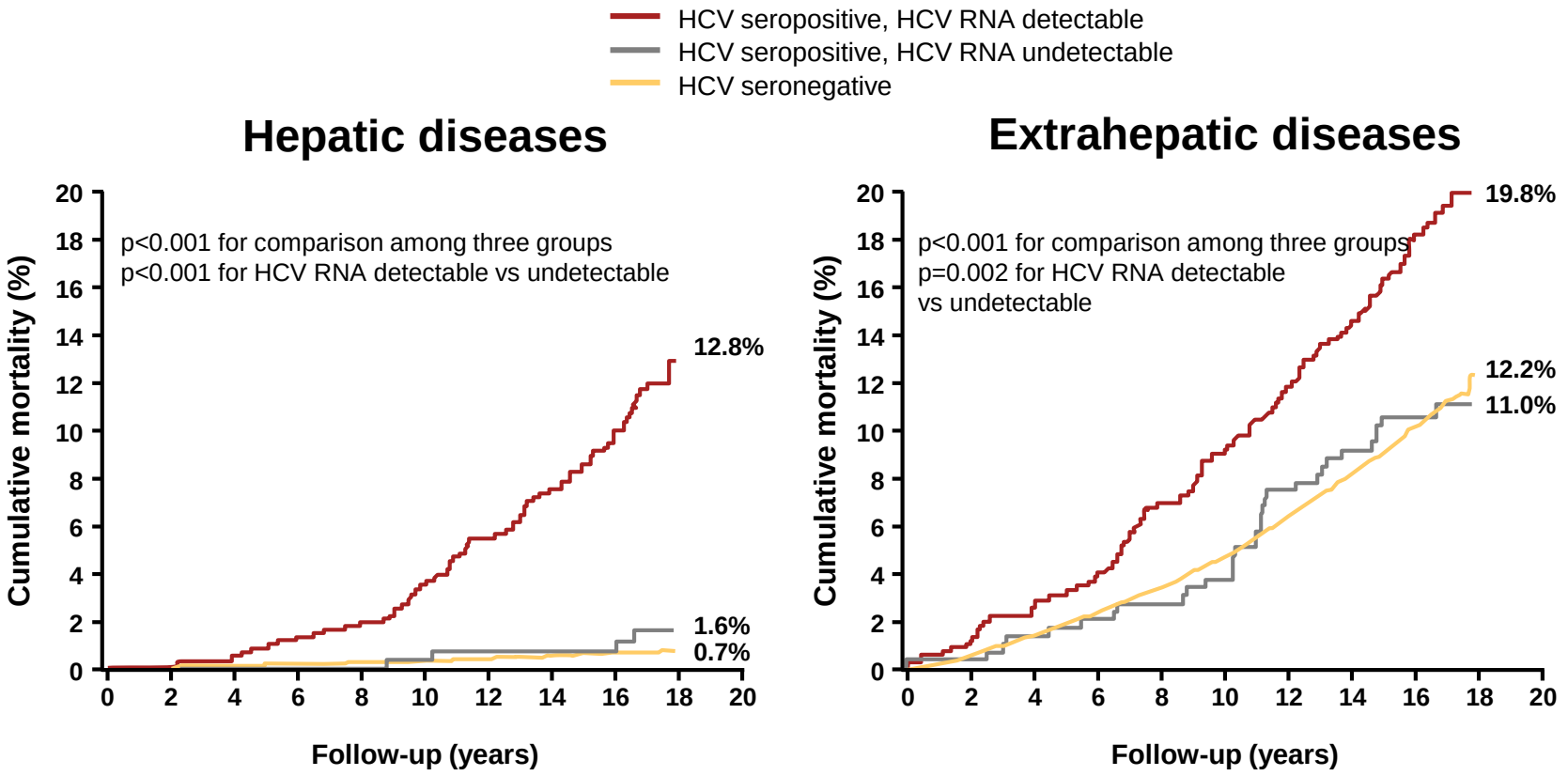
- **62–84%** reduction in all-cause mortality
- **68–79%** reduction in risk of HCC
- **90%** reduction in risk of liver transplant

Saleem J, et al. AASLD 2014; Poster #44

HCC: hepatocellular carcinoma; IFN: interferon; SVR: sustained virological response

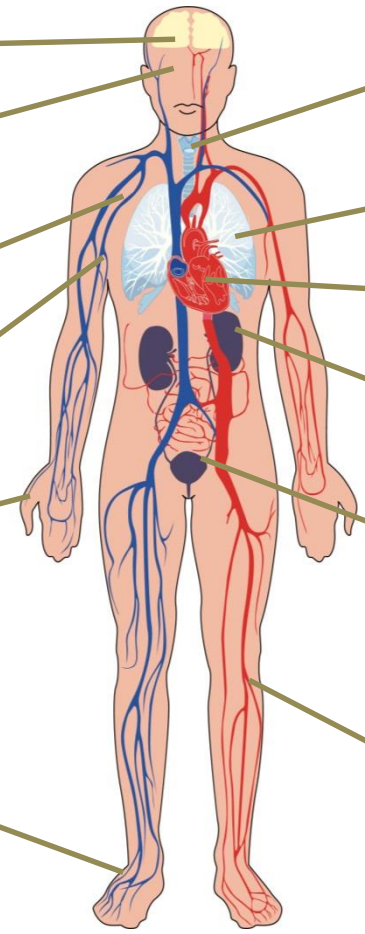
# HCV Cure Decreases Mortality from Both Hepatic and Non-hepatic Diseases

23,820 adults in Taiwan; 1095 anti-HCV positive, 69.4% with detectable HCV RNA




Lee MH, et al. J Infect Dis 2012;206:469–77

# Extrahepatic Manifestations of Chronic HCV Infection



Neuropsychiatric manifestations

Ocular manifestations

Hematological disorders/ malignancies

Mixed cryoglobulinemia

Skin manifestations

Peripheral neuropathy

Thyroid dysfunction

Pulmonary fibrosis

Cardiovascular/ metabolic diseases

Renal impairment

Reduced fertility

Musculoskeletal and connective tissue disorders

Extrahepatic disease can be present in up to **74%** of individuals with chronic HCV

Cacoub P, *et al. Dig Liver Dis* 2014; **46**(Suppl 5)**:**S165–S173; Negro F, *et al*. *Gastroenterology* 2015; **149:**1345–1360; Englert Y, *et al. Fertil Steril* 2007; **88:**607–11.

# Treatment of HCV Is Associated with Lymphoma Remission and Reduced Incidence for Lymphoma

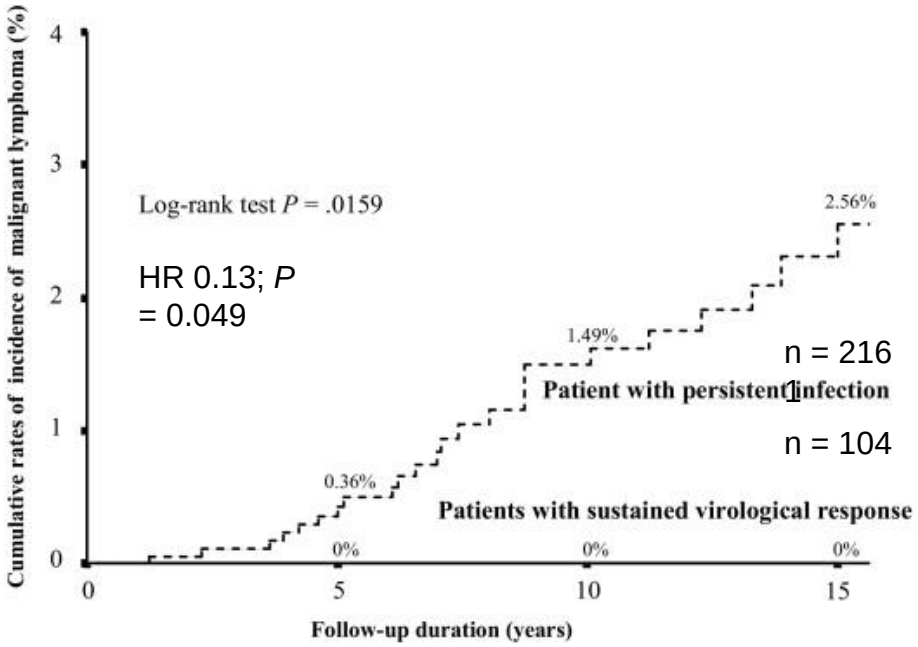
Multicentric study of 116 HCV infected patients with B-NHL. 70/116 (60%) patients were treated with pegIFN + RBV, 6 of which also received a protease inhibitor [1]

- **SVR achieved in 61% patients with MZL and 53% with DLBCL**
- **Outcome analysis showed a favourable association between Overall Survival and AT in all patients**

Mechanism of HCV-induced lymphomagenesis is unknown but may be related to chronic stimulation of B cells by viral antigens[3]

MZL, Marginal Zone Lymphoma;
DLBCL, diffuse large B –cell lymphoma.

Retrospective study of HCV-infected patients: 501 untreated and 2708 treated with IFN therapy[2]

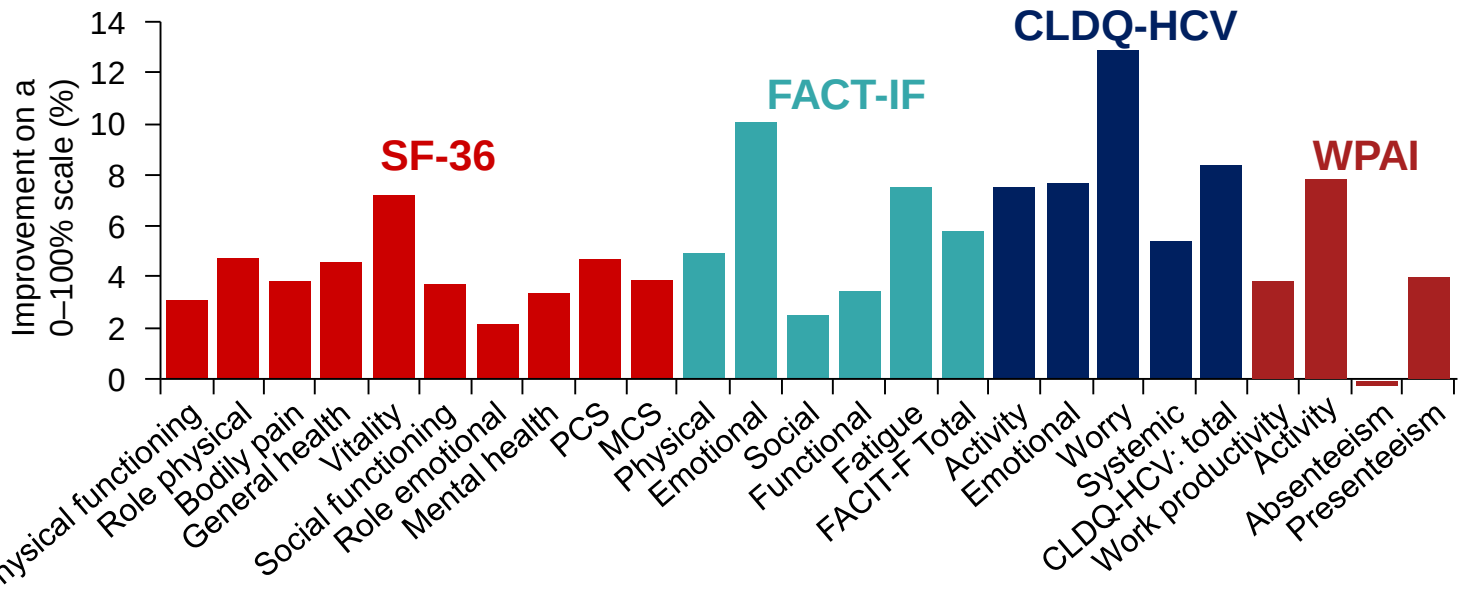



Risk of lymphoma in patients without SVR is **7 × higher** than in patients with SVR


1. Michot JM, *et al. Am J Hematol* 2015 **90:**197–203;
2. Kawamura Y, *et al*. *Am J Med* 2007; **120:**1034–1041;
3. Vannata B, *et al*. *Ther Adv Hematol* 2016; **7**:94–107.

# SVR is associated with improved quality of life

**Improvements in patient-reported outcomes in the ION study programme of LDV/SOF ± RBV**

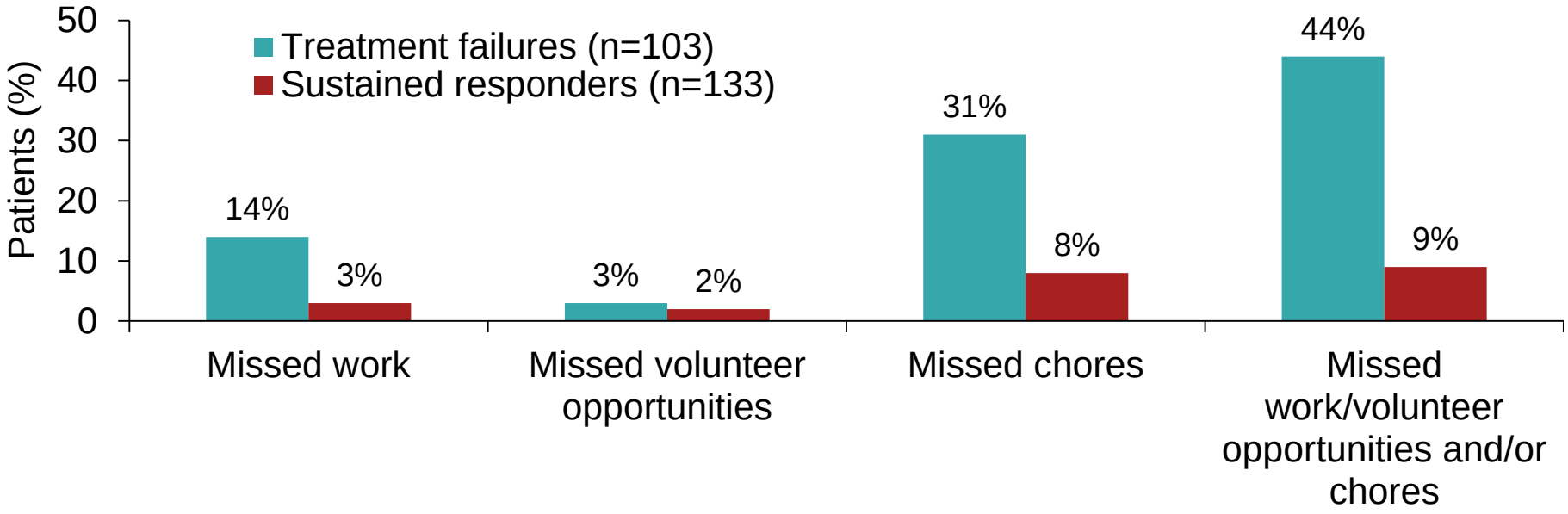



Younossi ZM, et al. AASLD 2014; Oral #77;
Younossi ZM, et al. J Hepatol 2015;63:337–45



CLDQ: Quality of Life Index for Patients with Chronic Liver Disease; FACIT-F: Functional Assessment of Chronic Illness Therapy – Fatigue; LDV: ledipasvir; MCS: mental component summary; PCS: physical component summary; RBV: ribavirin; SF-36: short form 36; SOF: sofosbuvir; SVR: sustained virological response; WPAI: Work Productivity and Activity Index

# SVR has a positive impact on work and productivity variables: Canadian survey




| | Treatment failures (n=102) | Sustained responders (n=133) | P-value |
|---|---|---|---|
| Employed | 51% | 67% | 0.02 |
| Social assistance income | 36% | 26% | 0.1 |

John-Baptiste AA, et al. Am J Gastroenterol 2009;104:2439–48

SVR: sustained virological response

# Treatment Options

# Posology of dual antiviral combinations

| | Dose per tablet | Number of tablets | Food effect |
|---|---|---|---|
| Sofosbuvir + Ledipasvir | 400 mg / 90 mg | 1 tablet / day | with or without |
| Sofosbuvir + Velpatasvir | 400 mg / 100 mg | 1 tablet / day | with or without |
| Grazoprevir + Elbasvir | 100 mg / 50 mg | 1 tablet / day | with or without |
| Glecaprevir + Pibrentasvir | 100 mg / 40 mg | 3 tablets / day | with food |

# Efficacy, safety, and tolerability of dual antiviral combinations

| | SVR | Side effects | Laboratory abnormalities |
|---|---|---|---|
| Sofosbuvir + Ledipasvir | > 95% | headache, fatigue | amylase, CK |
| Sofosbuvir + Velpatasvir | > 95% | headache, fatigue, sickness | amylase, CK |
| Grazoprevir + Elbasvir | > 95% | Reduced appetite, sleeplessness, anxiety, depression, vertigo, headache, sickness, diarrhea, u.a., pruritus, arthralgia, asthenia, irritibility | bilirubin, ALT |
| Glecaprevir + Pibrentasvir | > 95% | headache, diarrhea, sickness, fatigue | bilirubin, ALT |

# Important drug-drug interactions* (DDI) of dual antiviral combinations

| | DDI |
|---|---|
| Sofosbuvir + Ledipasvir | Amiodaron, anticonvulsants, antacids, PPI (high dose), rifampicin, St John‘s Worth, statins |
| Sofosbuvir + Velpatasvir | Amiodaron, anticonvulsants, antacids, PPI (high dose), rifampicin, efavirenz, St John‘s Worth, statins |
| Grazoprevir + Elbasvir | Dabigatran, anticonvulsants, antimycotics, bosentan, St John‘s Worth, atazanavir, darunavir, lopinavir, u.a., efavirenz, statins, ciclosporin, modafinil |
| Glecaprevir + Pibrentasvir | Dabigatran, anticonvulsants, rifampicin, ethinylestradiol, St John‘s Worth, atazanavir, darunavir, efavirenz, statins, ciclosporin, omeprazol |

*HEP Drug Interactions, University of Liverpool: http://www.hep-druginteractions.org
*HEP Mobile Apps (Apple, Android)

# Characteristics of dual antiviral combinations

| | Genotypic activity | CKD-4,5 | decompensated cirrhosis |
|---|---|---|---|
| Sofosbuvir + Ledipasvir | not GT-2 & GT-3 | no | yes |
| Sofosbuvir + Velpatasvir | pangenotypic | no | yes |
| Grazoprevir + Elbasvir | not GT-1 & GT-4 | yes | no |
| Glecaprevir + Pibrentasvir | pangenotypic | yes | no |

# **SmPC (abbrev.)**: Sofosbuvir + Ledipasvir (Harvoni®)

**Recommended treatment duration for Harvoni and the recommended use of co-administered ribavirin for certain subgroups**

Excellent regimen, trials and real-world data support 8-wks treatment duration in non-cirrhotic patients infected with HCV-1

**but**

No unique characteristic not covered by the two pan-genotypic regimen

http://www.ema.europa.eu/docs/en_GB/document_library/EPAR_-_Product_Information/human/003850/WC500177995.pdf; January 2018

# **SmPC**: Grazoprevir + Elbasvir (Zepatier®)

**Recommended ZEPATIER therapy for treatment of chronic hepatitis C infection in patients with or without compensated cirrhosis (Child-Pugh A only)**

Excellent regimen for patients infected with HCV-1b, limited data support 8-wks treatment duration in non-cirrhotic patients infected with HCV-1b

**but**

No unique characteristic not covered by the two pan-genotypic regimen

[A] In the clinical studies, the dose of ribavirin was weight-based (< 66 kg = 800 mg/day, 66 to 80 kg = 1,000 mg/day, 81 to 105 kg = 1,200 mg/day, > 105 kg = 1,400 mg/day) administered in two divided doses with food.

http://www.ema.europa.eu/docs/en_GB/document_library/EPAR_-_Product_Information/human/004126/WC500211235.pdf; January2018

# **SmPC**: Sofosbuvir + Velpatasvir (Epclusa®)

**Recommended treatment and duration for all HCV genotypes**

| Patient population[a] | Treatment and duration |
|---|---|
| Patients without cirrhosis and patients with compensated cirrhosis | Epclusa for 12 weeks<br>Addition of ribavirin may be considered for genotype 3 infected patients with compensated cirrhosis |
| Patients with decompensated cirrhosis | Epclusa + ribavirin[b] for 12 weeks |

[a] Includes patients co-infected with human immunodeficiency virus (HIV) and patients with recurrent HCV post-liver transplant

[b] RBV 1000-1200 mg/day in CPT B prior LTx;
RBV 600 mg/day in CPT C prior LTx and CPT B or C after LTx

http://www.ema.europa.eu/docs/en_GB/document_library/EPAR_-_Product_Information/human/004210/WC500211151.pdf; January 2018

# **SmPC**: Glecaprevir + Pibrentasvir (Maviret®)

**(1) Recommended treatment duration for Maviret in treatment-naive patients**

| Genotype | Recommended treatment duration | |
|---|---|---|
| | w/o cirrhosis | with cirrhosis |
| GT 1, 2, 4-6 | 8 wks | 8 wks |
| GT 3 | 8 wks | 12 wks |

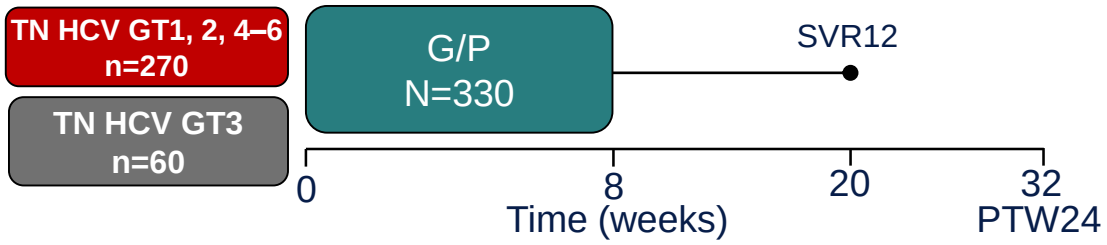
**(2) Recommended treatment duration for Maviret in patients, with peg-IFN + Ribavirin +/- Sofosbuvir or Sofosbuvir + Ribavirin non-response**

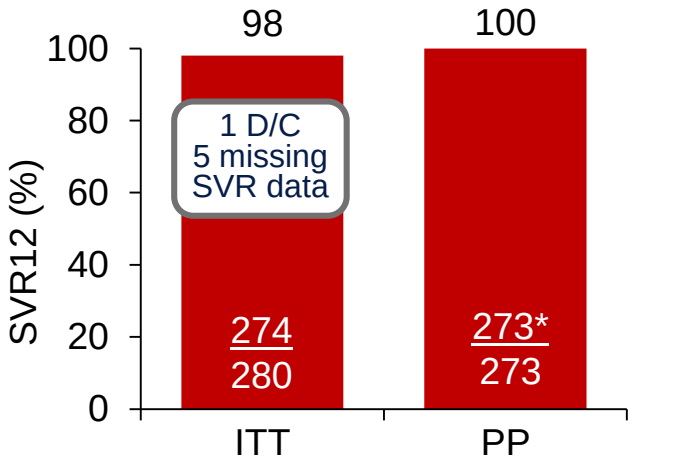
| Genotype | Recommended treatment duration | |
|---|---|---|
| | w/o cirrhosis | with cirrhosis |
| GT 1, 2, 4-6 | 8 wks | 12 wks |
| GT 3 | 16 wks | 16 wks |

SmPC Maviret, September 2019

# Preliminary Efficacy and Safety of 8-Week GLE/PIB in Patients With HCV GT1–6 Infection and Compensated Cirrhosis: The EXPEDITION-8 Study

EXPEDITION-8 is a Phase 3, nonrandomized, single-arm, open-label study in adults with chronic HCV GT1–6 infection with compensated cirrhosis who are HCV treatment-naive




*1 patient dosed for <8 weeks achieved SVR12

- G/P for 8 weeks was well tolerated with high SVR12 rates in TN patients with CC
- No virologic failures to date

Brown R. et al, AASLD 2018, LB-07 (oral presentation)

# Comparison of pangenotypic regimens

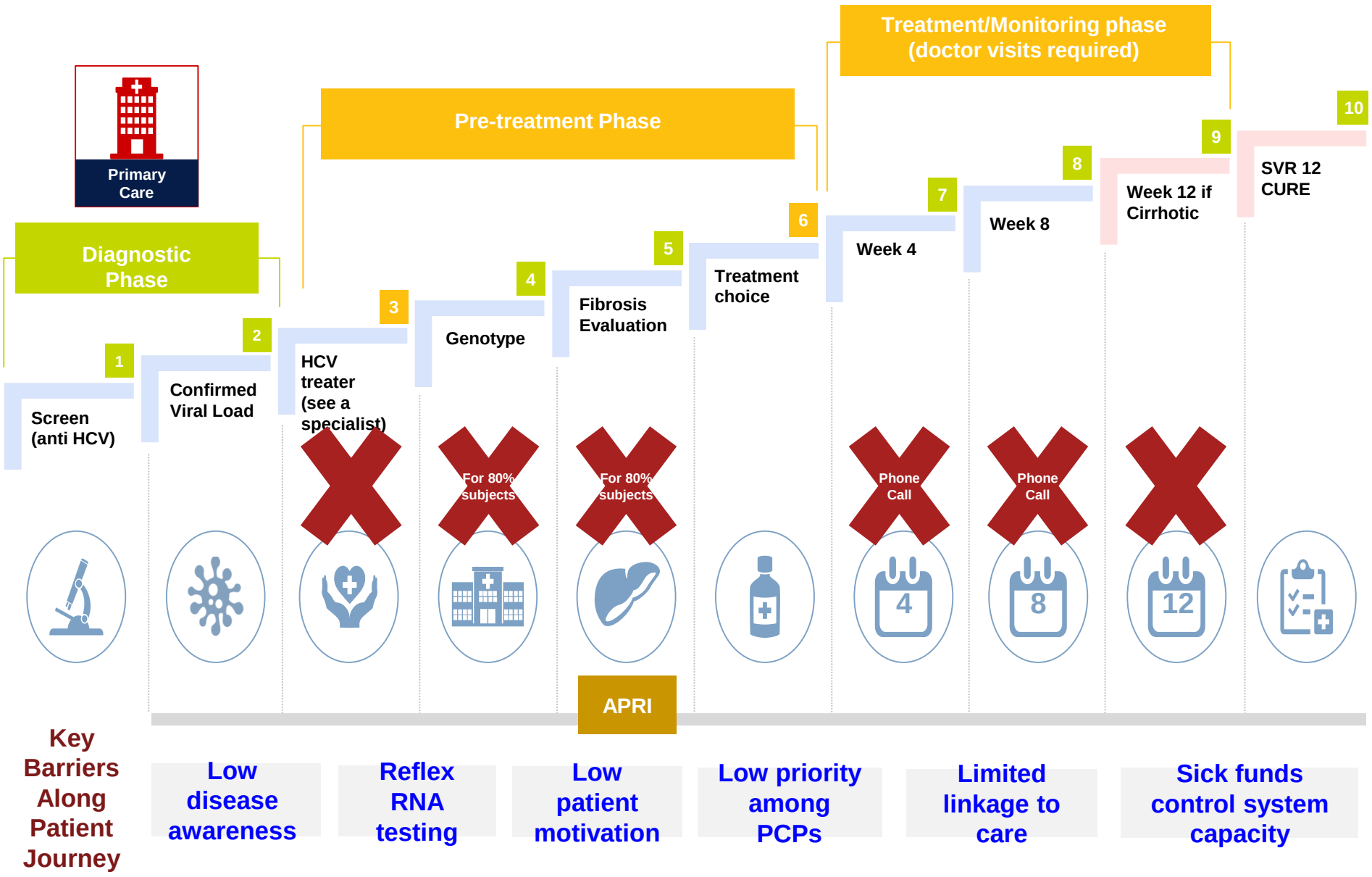
## Sofosbuvir + Velpatasvir

- ✓ Treatment duration 12 weeks
- ✓ Decompensated cirrhosis
- ✓ CrCl > 30 ml/min
- ✓ RBV in GT3 patients with cirrhosis and all patients with decompensated cirrhosis

## Glecaprevir + Pibrentasvir

- ✓ Treatment duration in Tx-naive patients 8 weeks (12 weeks in GT3 with CC)
- ✓ Treatment of patients with renal impairment possible, but not of patients with decompensated cirrhosis
- ✓ Treatment duration in TX-experienced patients between 8 wks (w/o cirrhosis), 12 wks (with cirrhosis) and 16 wks (GT3 w or w/o cirrhosis)
- ✓ No RBV for GT3-patients with cirrhosis

# Treatment cascade simplification



# HCV Elimination

# Eradication and Elimination

## Eradication

Permanent reduction to zero of the worldwide incidence of infection; intervention measures are no longer needed

**Example:**

**Smallpox**

## Elimination

Reduction to zero of the incidence of infection in a defined geographical area; continued intervention measures are required

**Example:**

**Poliomyelitis**

# Is elimination of HCV feasible?

- HCV meets all established criteria for elimination:
  - No non-human reservoir
  - Virus cannot amplify in the environment
  - Simple and accurate diagnostic tools
  - Practical interventions to interrupt transmission
  - **Infection is curable**

Edlin BR, Winkelstein ER. Antivir Res 2014;110:79–93

SVR: sustained virological response

# Many steps are required to move from cure of the individual to HCV elimination within a population

**Viral elimination within a population**

**SVR = viral elimination at a patient level**

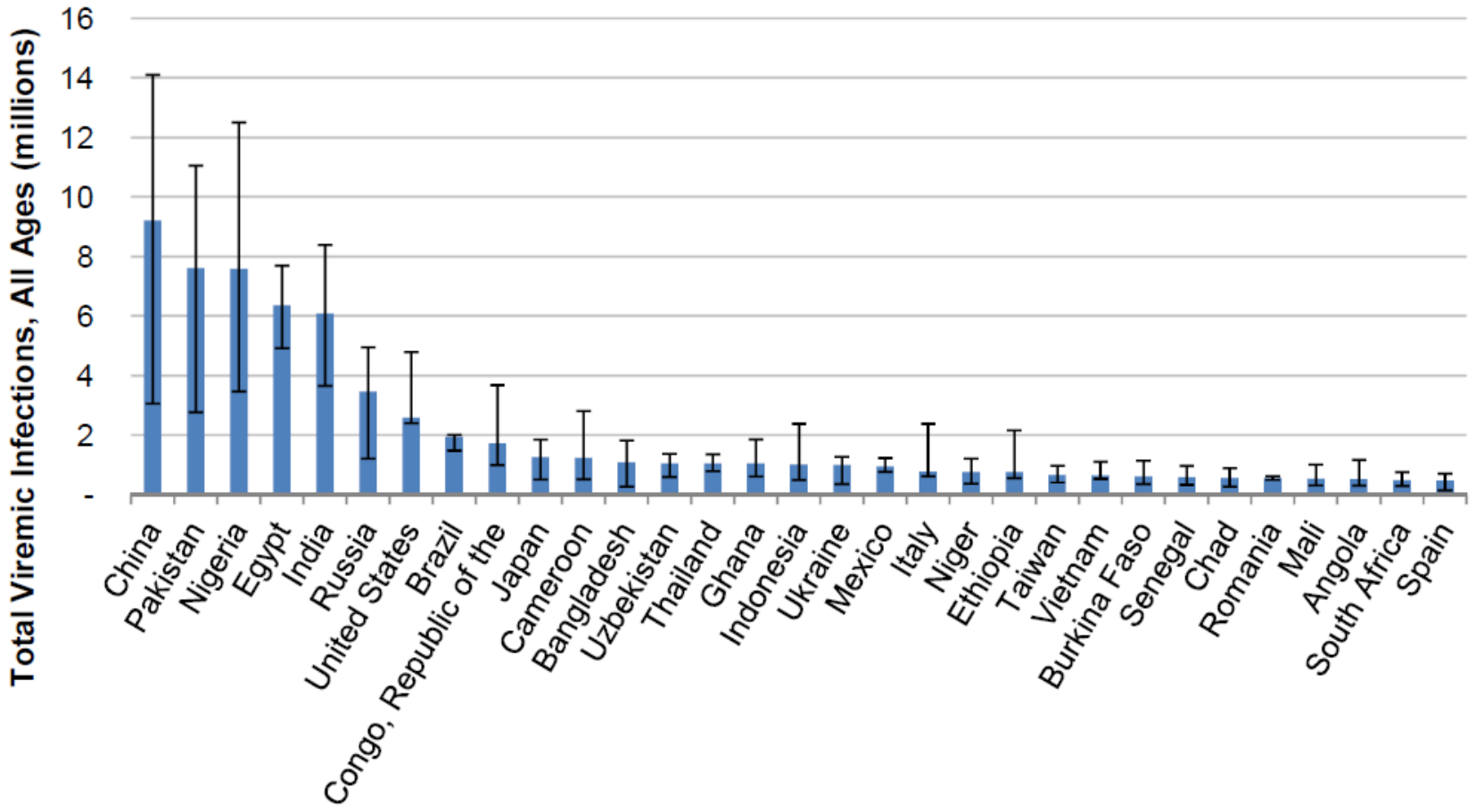
SVR: sustained virological response

# Requirements for elimination

- Epidemiology/HCV surveillance
- HCV screening
- Diagnosis of HCV – linking patients into care and treatment
- Prevention of transmission
  - Harm reduction and treatment as prevention in high-risk populations
  - Change in unsafe medical practices to prevent iatrogenic transmission
- Collaboration between stakeholders

# Total Viremic HCV Infections

## Countries Responsible for 80% of Global Infections

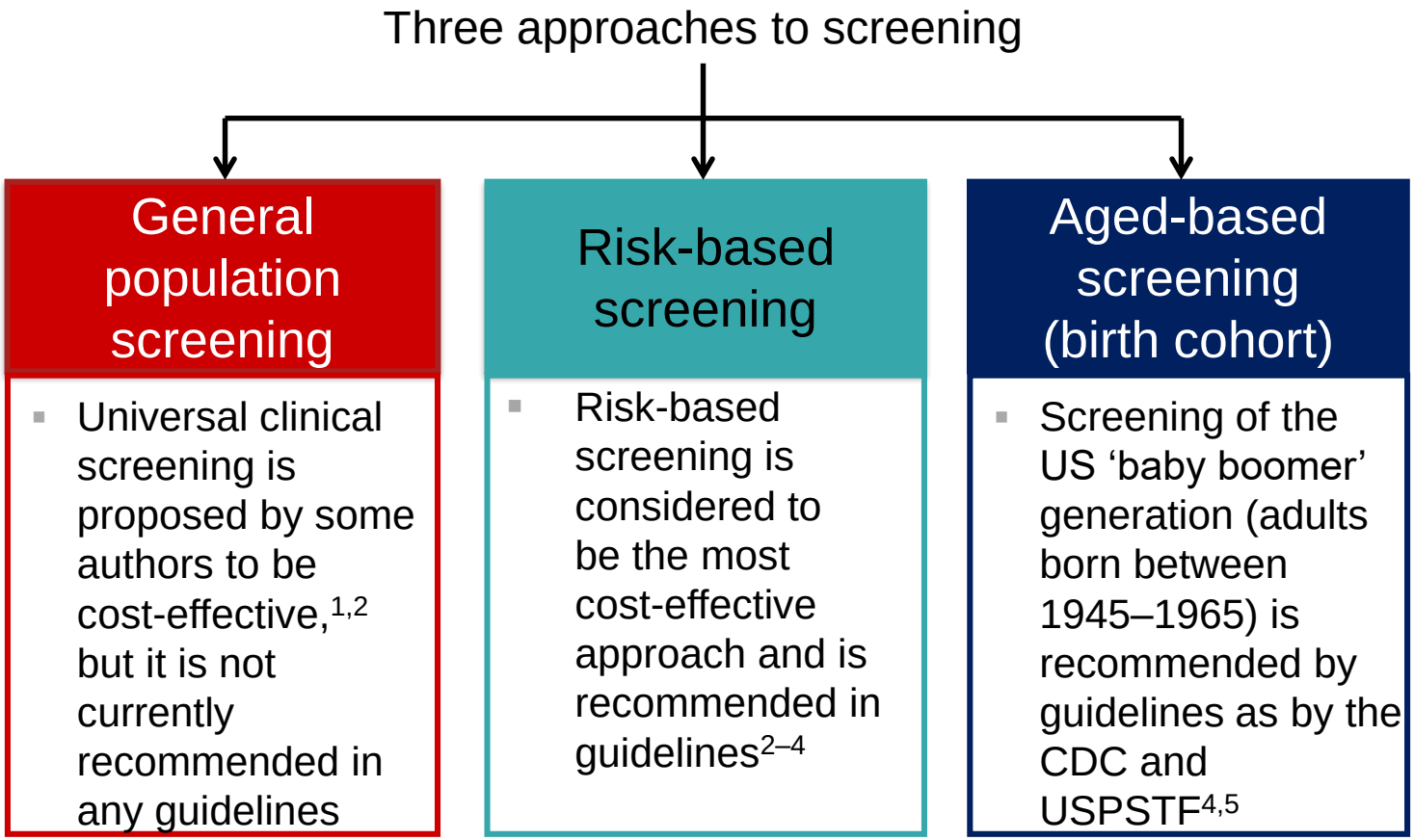



Gower, E., Estes C., Hindman, S., Razavi-Shearer, K., Razavi, H., Global epidemiology and genotype distribution of the hepatitis C virus, Journal of Hepatology (2014)

# Requirements for elimination

- Epidemiology/HCV surveillance
- HCV screening
- Diagnosis of HCV – linking patients into care and treatment
- Prevention of transmission
  - Harm reduction and treatment as prevention in high-risk populations
  - Change in unsafe medical practices to prevent iatrogenic transmission
- Collaboration between stakeholders

# HCV screening




1. Hahné SJM, et al. BMC Infect Dis 2013;13:181; 2. Hagan L, Schinazi RF. Liver Int 2013;33: 68–79; 3. World Health Organization (WHO). Guidelines for the screening, care and treatment of persons with hepatitis infection, 2014. Available at: www.who.int/hiv/pub/hepatitis/hepatitis-c-guidelines/en (accessed March 2016); 4. American Association for the Study of Liver Diseases (AASLD)/Infectious Diseases Society of America (IDSA). HCV guidance: recommendations for testing, managing, and treating hepatitis C. Available at: www.hcvguidelines.org (accessed March 2016); 5. Smith BD, et al. Ann Intern Med 2012;157:817–22

CDC: US Centers for Disease Control and Prevention; USPSTF: US Preventive Services Task Force

# HCV screening

- Different screening and management strategies are needed to satisfy societal and medical needs

**SOCIETAL NEED**
Prioritising high incident populations (i.e. PWID) impacts incident infection, but does not stop new cases of severe liver morbidity

**MEDICAL NEED**
Prioritising older patients with advanced liver fibrosis impacts severe liver morbidity, but does not reduce incident transmission

- Need management programmes to address both for optimal impact on HCV prevalence and reduction in HCV-related morbidity and mortality

Innes H, et al. Gut 2015;64:1800–9

PWID: people who inject drugs

# Requirements for elimination

- Epidemiology/HCV surveillance
- HCV screening
- Diagnosis of HCV – linking patients into care and treatment
- Prevention of transmission
  - Harm reduction and treatment as prevention in high-risk populations
  - Change in unsafe medical practices to prevent iatrogenic transmission
- Collaboration between stakeholders

# HCV treatment: linkage to care

Enhanced HCV screening and diagnosis

Expanded models of HCV treatment and care

Specific strategies for highly marginalised patients

National HCV strategies and political leadership

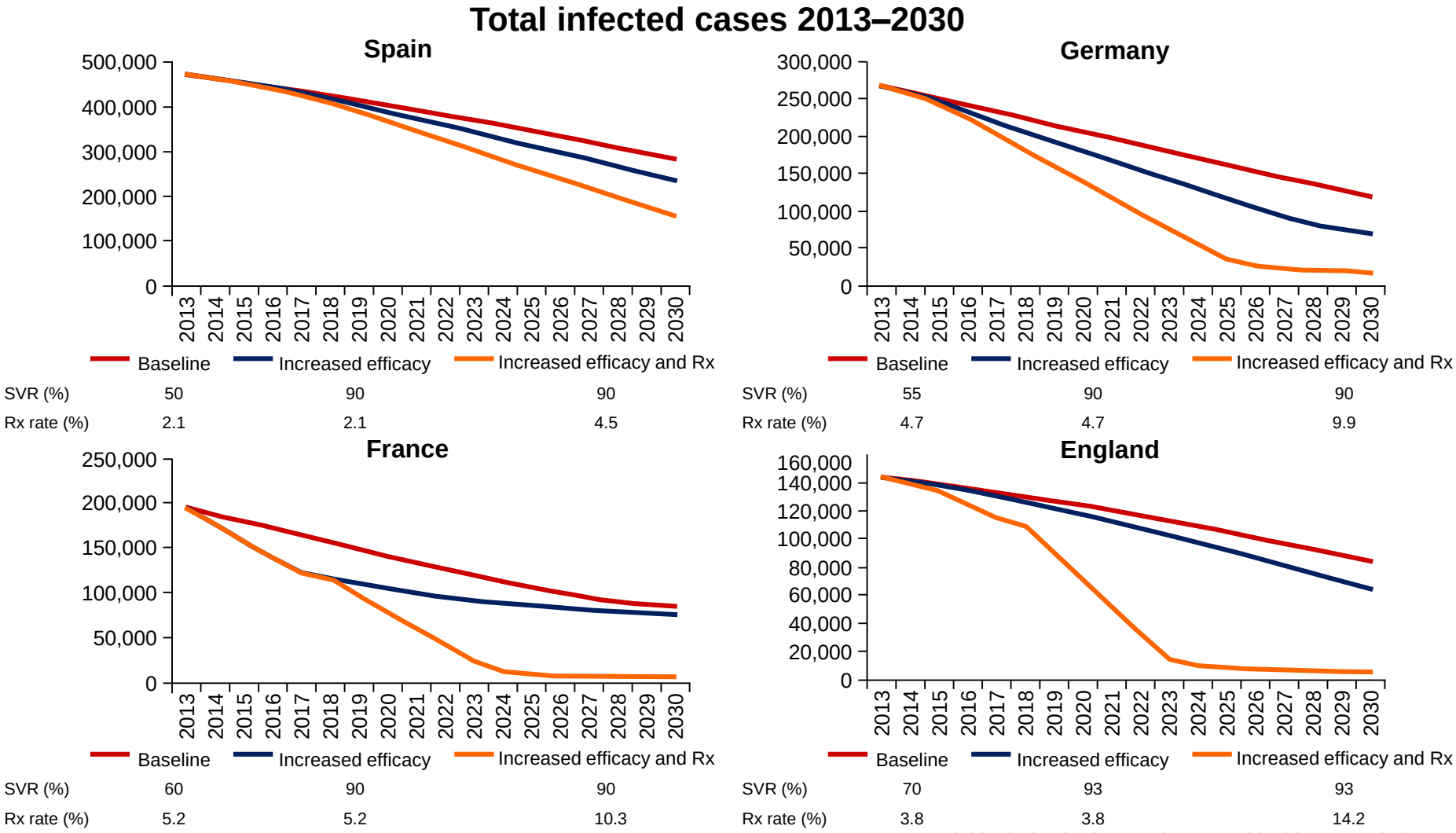
Removal of restrictions on access to IFN-free DAA therapy



Increased and broadened HCV prescribers

DAA: direct-acting antiviral agent; IFN: interferon

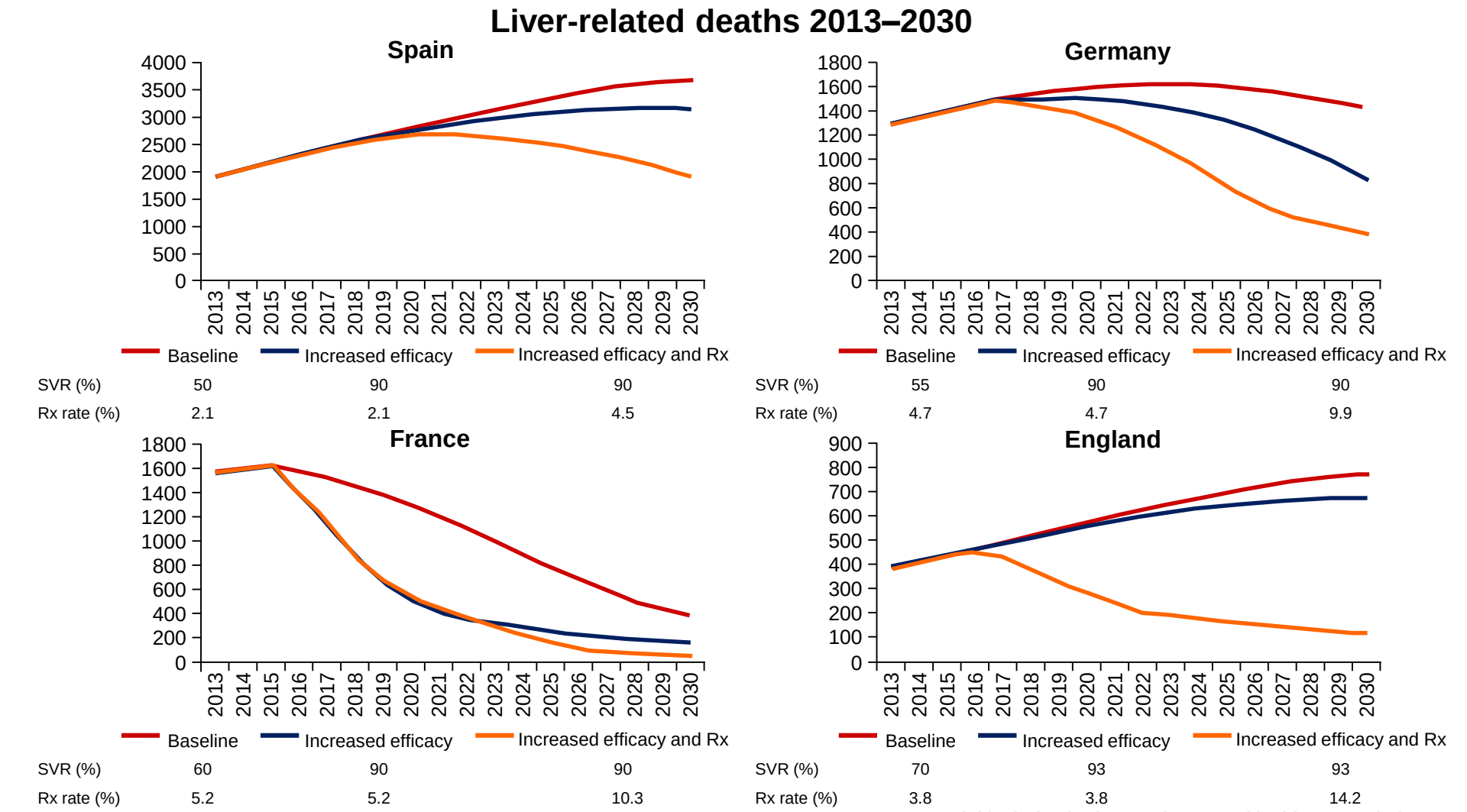
# Taking the right steps, the incidence of HCV in Europe could decrease over the next 10 years…




Wedemeyer H et al. J Viral Hepat 2014;21(Suppl 1):60–89

Model includes both prevalence and incident populations.
Rx: treatment; SVR: sustained virological response

# … and the incidence of HCV-associated liver-related mortality could also decrease

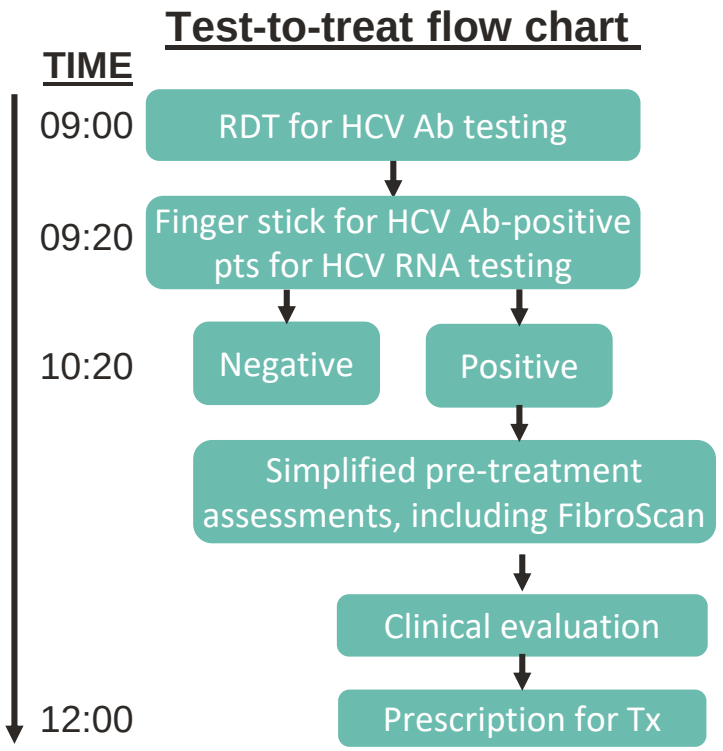


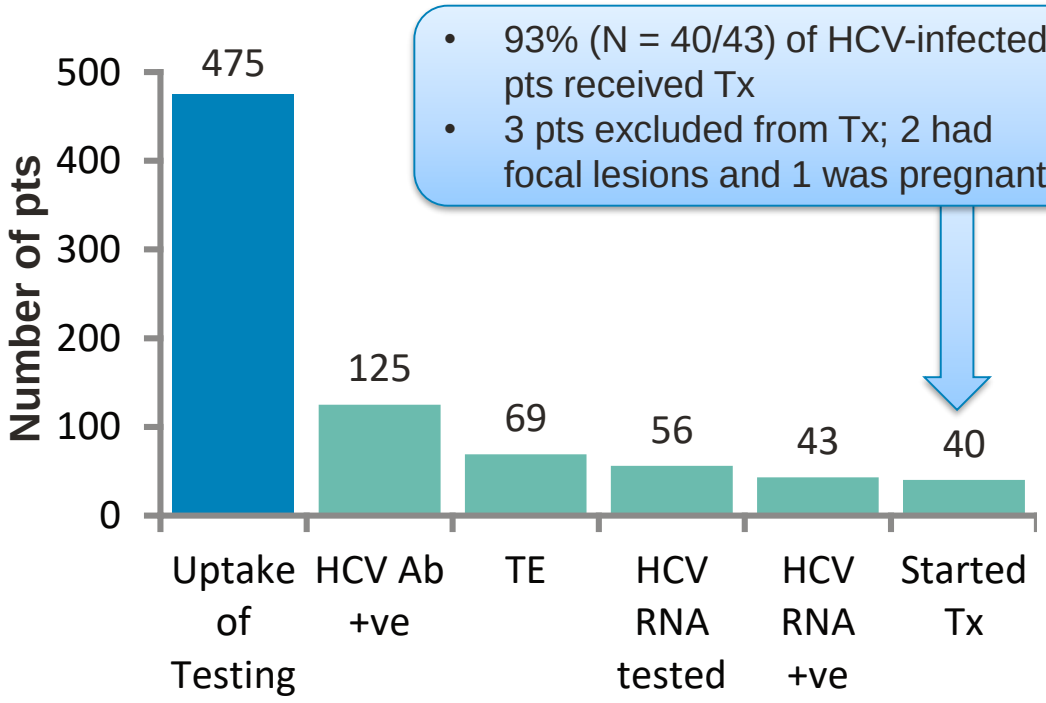

Wedemeyer H et al. J Viral Hepat 2014;21(Suppl 1):60–89

Model includes both prevalence and incident populations.
Rx: treatment; SVR: sustained virological response

# Improving Linkage to Care by Testing and Treatment on the Same Day of Screening: A Pilot Study

Pilot study assessing a same day "test-and-treat" program using a simplified care model and several POC tools for HCV infection in a rural village in Egypt (N = 475)



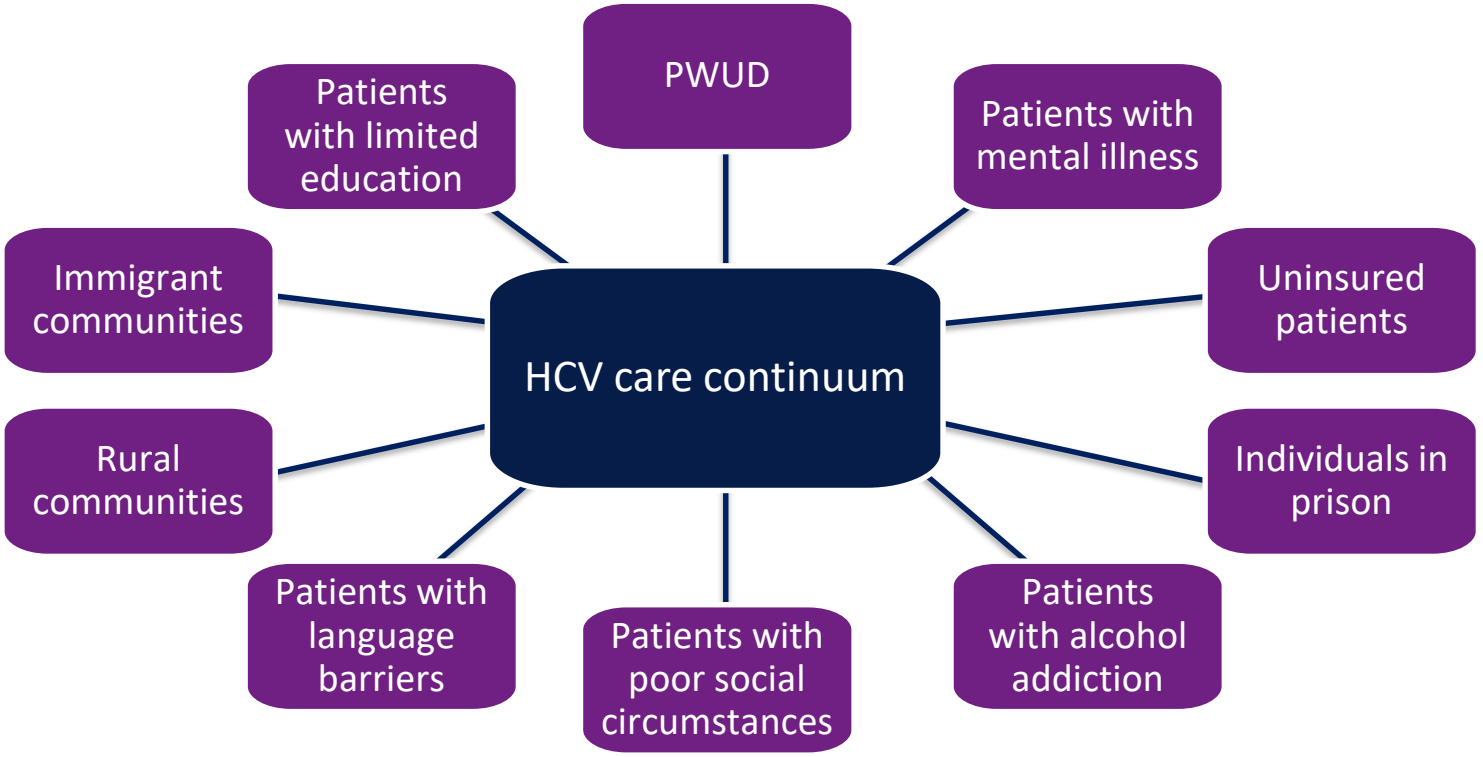

- 93% (N = 40/43) of HCV-infected pts received Tx
- 3 pts excluded from Tx; 2 had focal lesions and 1 was pregnant

This "test-and-treat" HCV program achieved almost complete linkage to care and treatment initiation; this model is effective and feasible in treating rural populations, however, additional studies are required

Ab, antibody; pts, patients; POC, point of care; RDT, rapid diagnostic test; TE, treatment-experienced; Tx, treatment; +ve, positive.

Shiha G, *et al*. EASL 2019; poster presentation (PS-069).

# Identifying Patients with Poor Linkage to Care




1. McGowan CE & Fried MW. *Liver Int* 2012; **32**(Suppl 1)**:**151–156;
2. Mendes LC*, et al. Braz J Med Biol Res* 2016; **49:**e5455;
3. Miller L, *et al.* AASLD 2016 (abstract 763);
4. Muir AJ & Naggie S. *Clin Gastroenterol Hepatol* 2015; **13:**2166–2172*;*
5. Evon DM, *et al. Aliment Pharmacol Ther* 2010; **32:**1163–1173;
6. Butt G, *et al*. *ISRN Nurs* 2013; **2013:**579529; 7. Arora S, *et al*. *N Engl J Med* 2011; **364:**2199–2207;
8. McGowan CE, *et al. Hepatology* 2013; **57:**1325–1332.

PWUD, people who use drugs.

# Requirements for elimination

- Epidemiology/HCV surveillance
- HCV screening
- Diagnosis of HCV – linking patients into care and treatment
- Prevention of transmission
  - Harm reduction and treatment as prevention in high-risk populations
  - Change in unsafe medical practices to prevent iatrogenic transmission
- Collaboration between stakeholders

# Strategies to minimise onward transmission – iatrogenic

**Universal screening of blood and blood products**

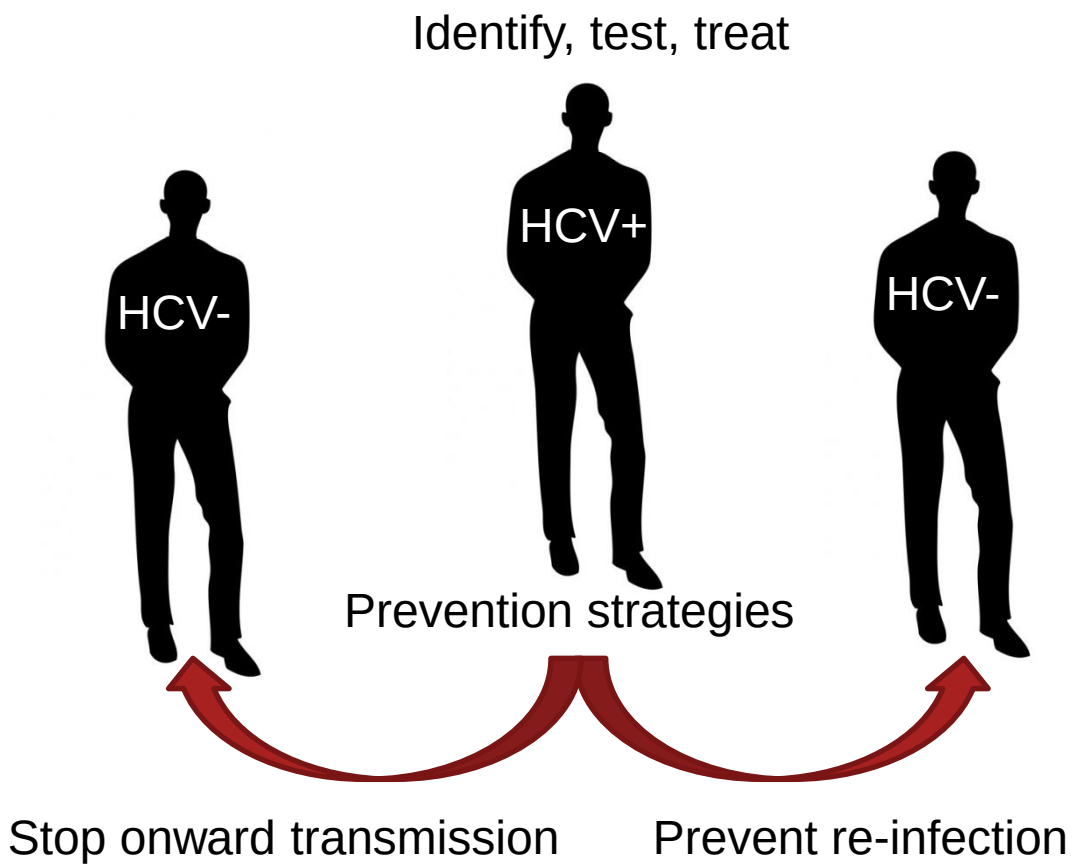
**Universal implementation of safe injection devices**

**Education of HCPs and public on iatrogenic HCV transmission**

Toronto declaration: strategies to control and eliminate viral hepatitis globally. Available at: www.liver.ca/files/PDF/Viral_Hepatitis/toronto_declaration_v1.0-final_logo.pdf (accessed March 2016)

HCP: healthcare provider

# Strategies to minimise onward transmission – high-risk behaviours




**Education:**

- HCV awareness
- Prevent transmitting to others
- Safe injection practices
- Sexual risk reduction

**Harm reduction interventions:**

- Opioid substitution therapy
- Needle syringe exchange
- Pre-exposure prophylaxis in MSM

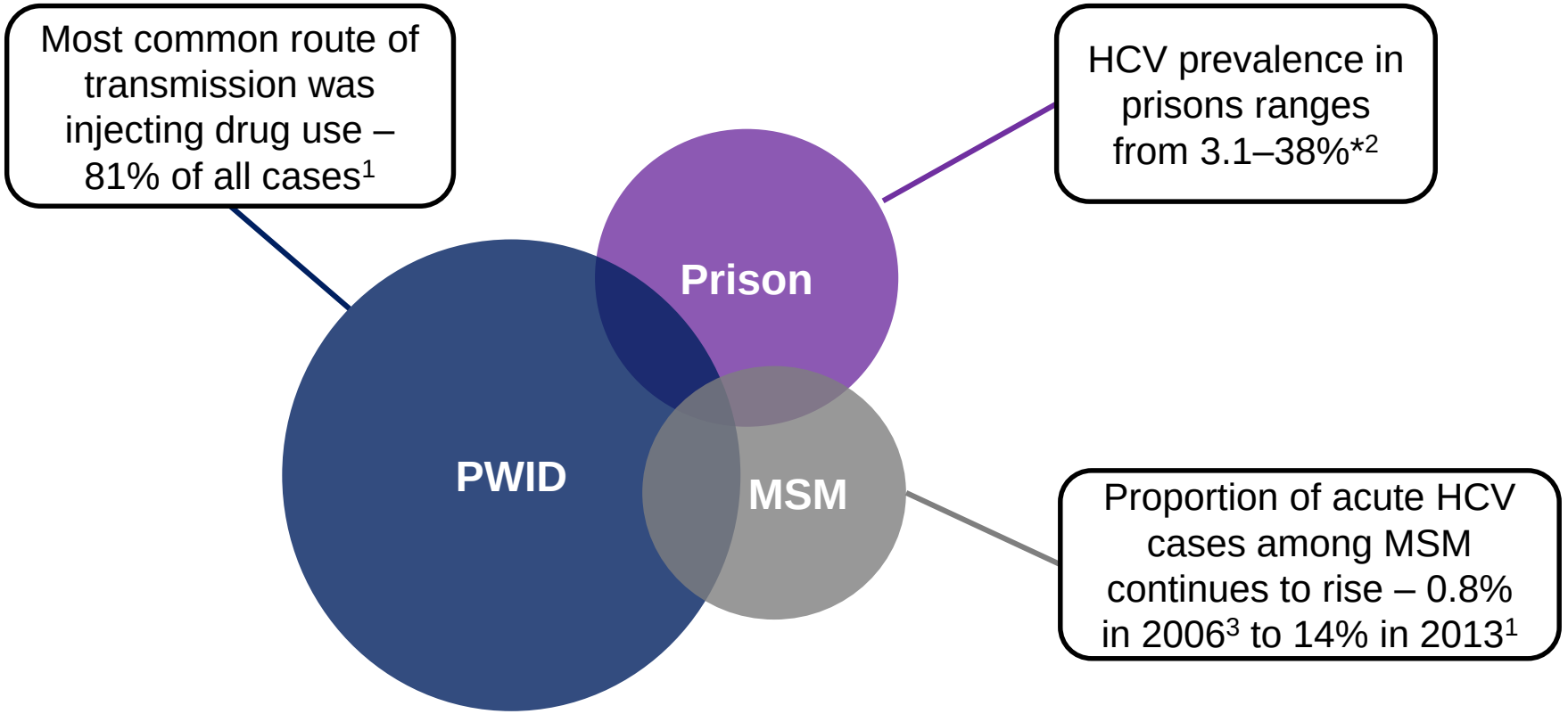
**Access to treatment:**

- New DAA regimens for HCV
- Treatment as prevention

Solomon SS, et al. Lancet Infect Dis 2015;15:36–45;
Sarna A, Panda S. Lancet Infect Dis 2015;15:4–5

Same trends as countries depicted across Europe.
DAA: direct-acting antiviral agent; MSM: men who have sex with men

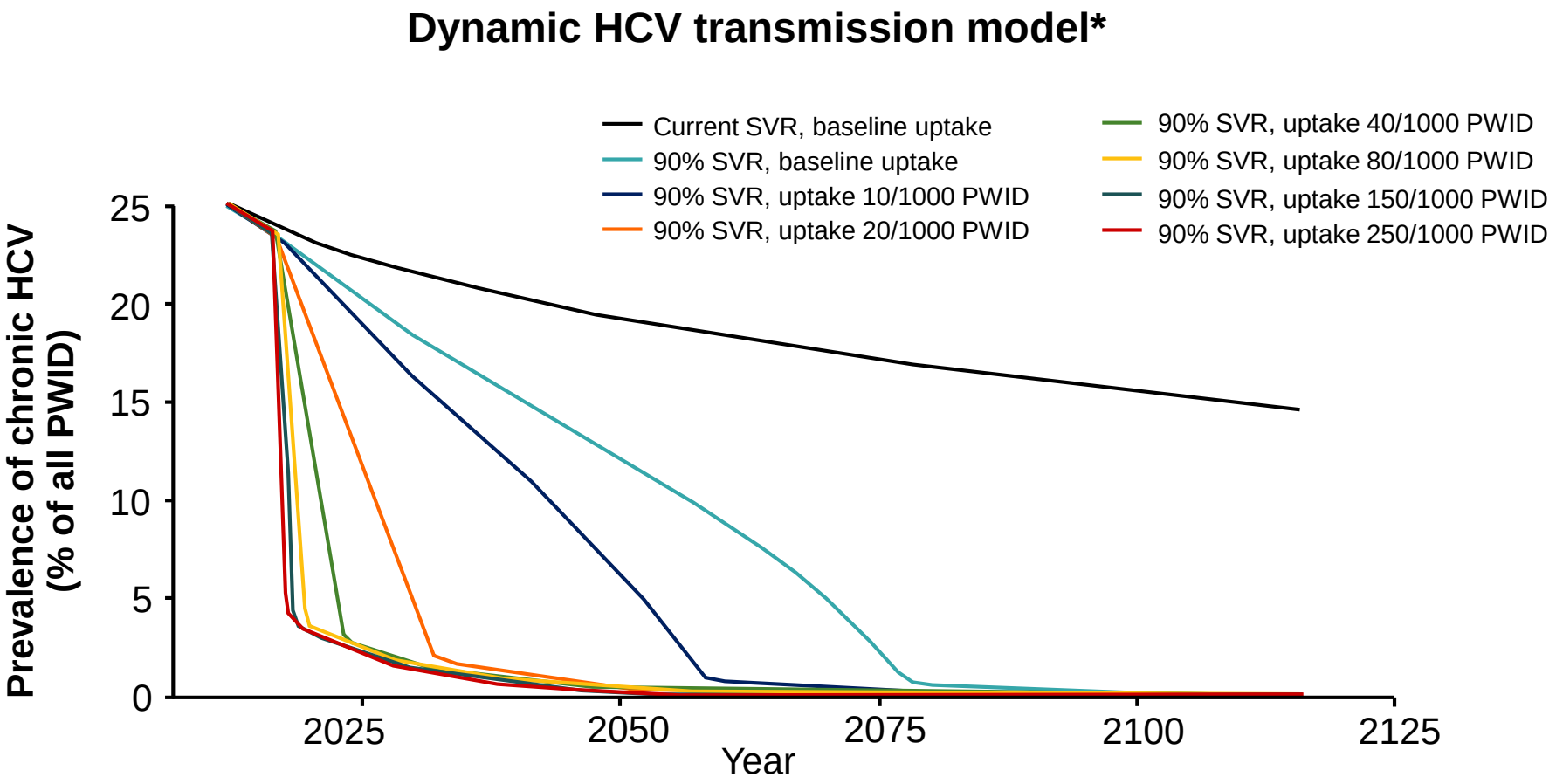
# Populations such as PWID, prisoners or MSM are at high risk of becoming infected and of infecting others




1. ECDC: Hepatitis C surveillance in Europe 2013. Available at: http://ecdc.europa.eu/en/publications/Publications/hepatitis-c-surveillance-in-europe-2013.pdf;
2. Zampino R, et al. World J Hepatol 2015; 7:2323–30;
3. ECDC: Hepatitis B and C surveillance in Europe 2012. Available at: http://ecdc.europa.eu/en/publications/Publications/hepatitis-b-c-surveillance-europe-2012-july-2014.pdf (All accessed February 2017)

*According to HCV endemicity in the geographical location of the prison and in the countries of origin of the foreign prisons and to the prevalence of intravenous drug use.
MSM: men who have sex with men;
PWID: people who inject drugs

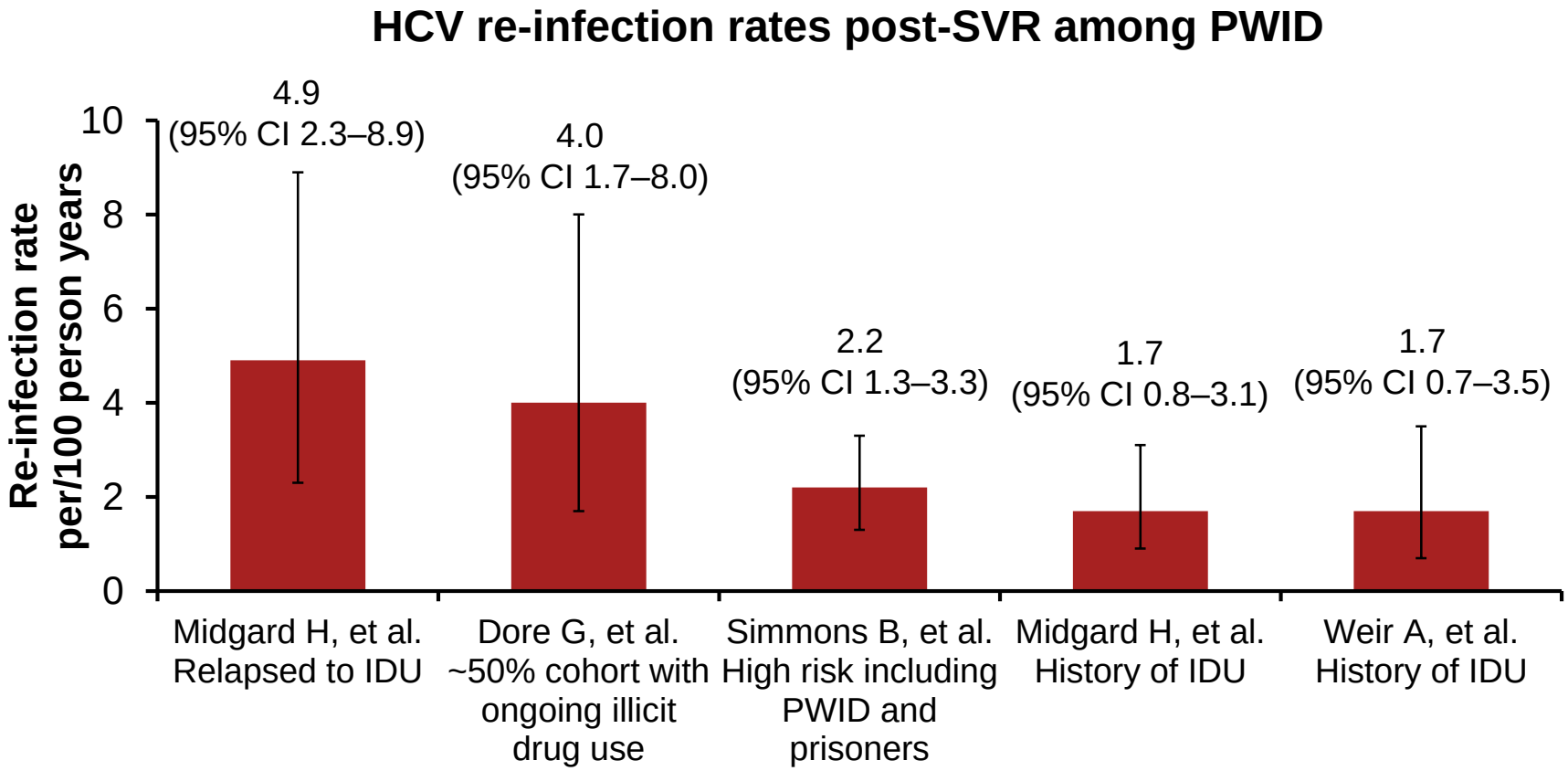
# Scaling-up HCV treatment in high-risk populations such as PWID will reduce HCV prevalence




*Values for all parameters included in the model are derived from the data published by Martin NK, et al. Hepatology 2013;58:1598–609 and are based on PWID population of Edinburgh. Current treatment = PEG-IFN + RBV up to 2012 and addition of telaprevir or boceprevir since 2012.
PEG-IFN: pegylated interferon; SVR: sustained virological response

Adapated from Bennett H, et al. PLoS One 2015;10:e125846

# Relatively low HCV re-infection rates have been reported among PWID




- Strategies to prevent HCV re-infection are required for people with ongoing risk behaviour

Weir A, et al. Drug Alcohol Depend; 2016;165:53–60; Midgard H, et al. J Hepatol 2016;64:1020–6; Simmons B, et al. Clin Infect Dis 2016;62:683–94; Dore G, et al. AASLD 2016; Poster #871

CI: confidence interval

# However more needs to be done for this population

Arain *et al. BMC Infectious Diseases* 2014, **14**(Suppl 6):S17
http://www.biomedcentral.com/1471-2334/14/S6/S17

BMC Infectious Diseases

**REVIEW** **Open Access**

Hepatitis C in European prisons: a call for an evidence-informed response

Amber Arain[1], Geert Robaeys[2,3,4], Heino Stöver[5*]

## Key recommendations

- HCV screening for those with high-risk factors
- HCV awareness education to increase testing uptake
- Provision of OST and injection equipment
- Counselling to avoid transmission
- Close collaboration between prison and public/community health services to ensure continued treatment and care

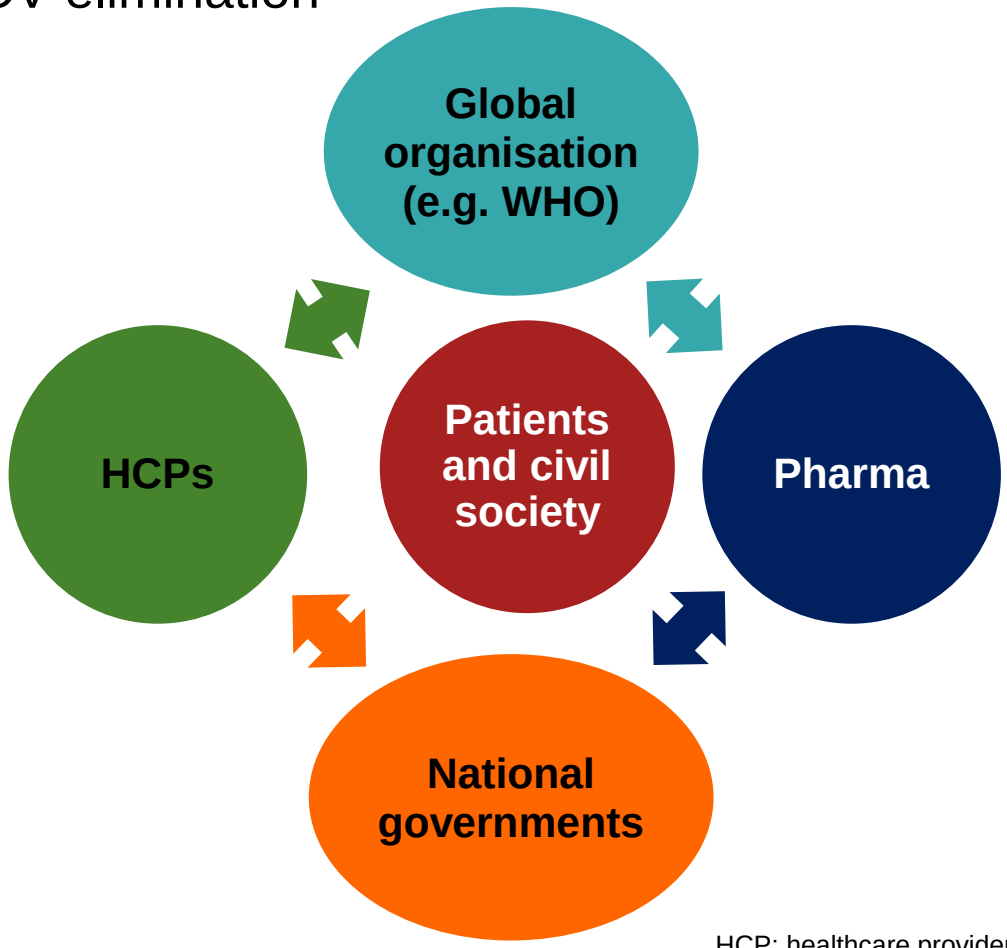
Arain A, et al. BMC Infect Dis 2014;14(Suppl 6):S17

# Requirements for elimination

- Epidemiology/HCV surveillance
- HCV screening
- Diagnosis of HCV – linking patients into care and treatment
- Prevention of transmission
  - Harm reduction and treatment as prevention in high-risk populations
  - Change in unsafe medical practices to prevent iatrogenic transmission
- Collaboration between stakeholders

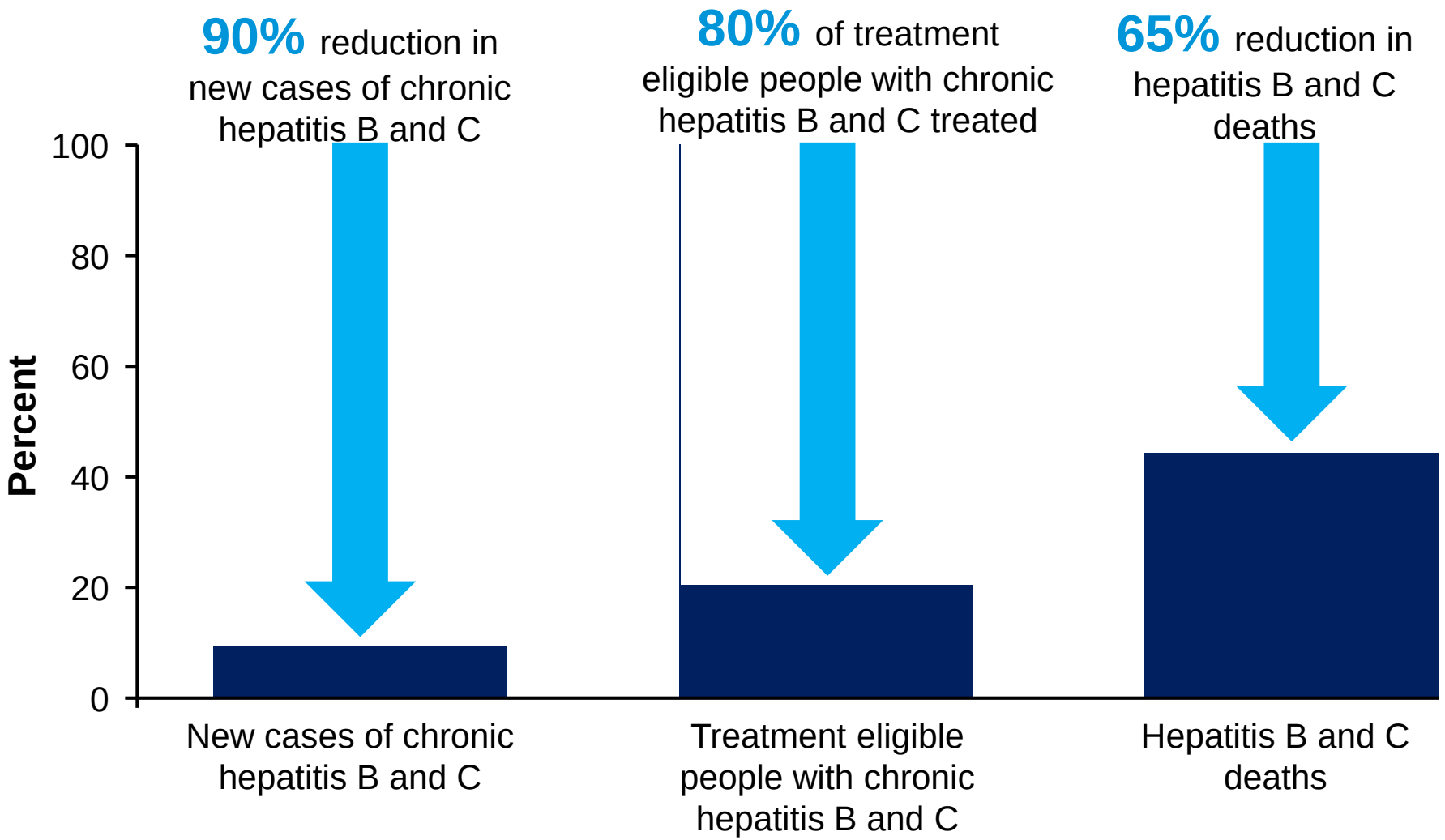
# Collaboration between stakeholders

- A collaborative approach from all stakeholders is necessary to achieve HCV elimination




HCP: healthcare provider; WHO: World Health Organization

# Global targets achieved if viral hepatitis is controlled by 2030



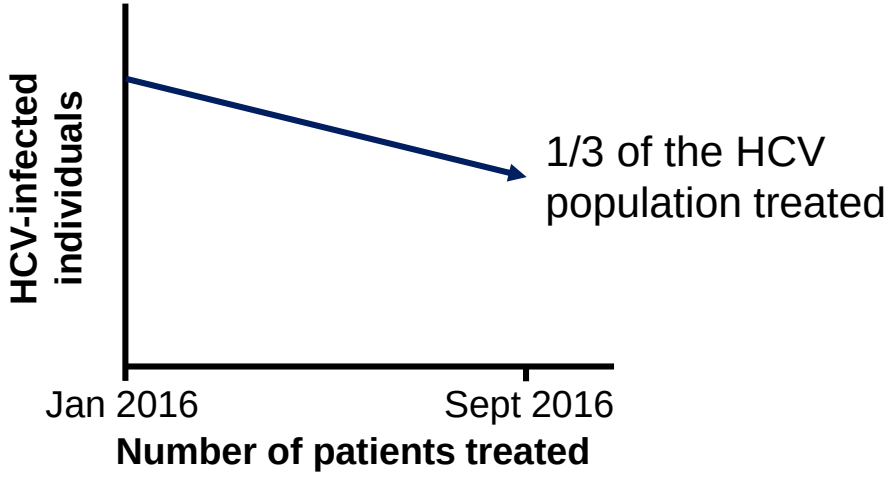

World Health Organization. Draft global health sector strategies. Viral Hepatitis, 2016–2021. Available at: http://apps.who.int/gb/ebwha/pdf_files/WHA69/A69_32-en.pdf?ua=1 (accessed September 2016)

# Iceland National HCV action plan


Population: ~333,000
Anti-HCV+: 1500
Chronic HCV: 800–1000
Historically, 20–30 patients treated per year

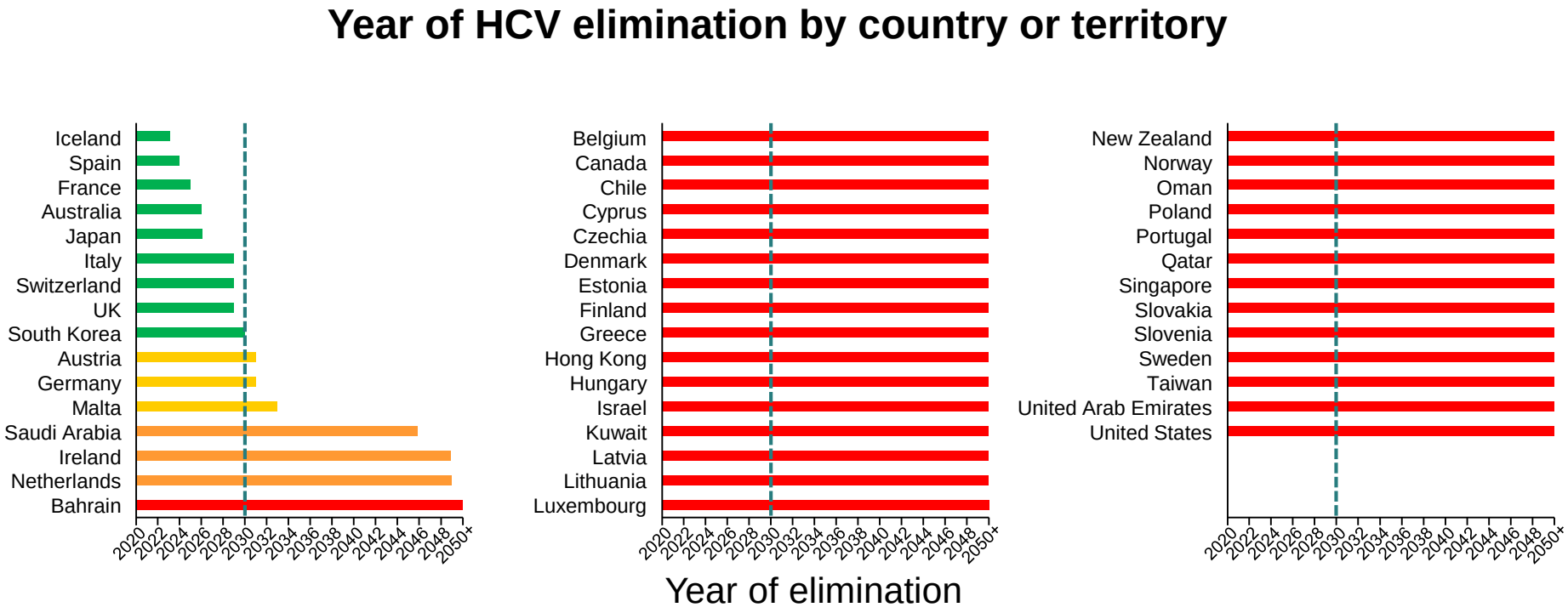
**National plan: treat all HCV patients according to Icelandic guidelines over 3 years**

- 200 patients/4 months
- Prioritise active PWID, patients with moderate-to-severe fibrosis



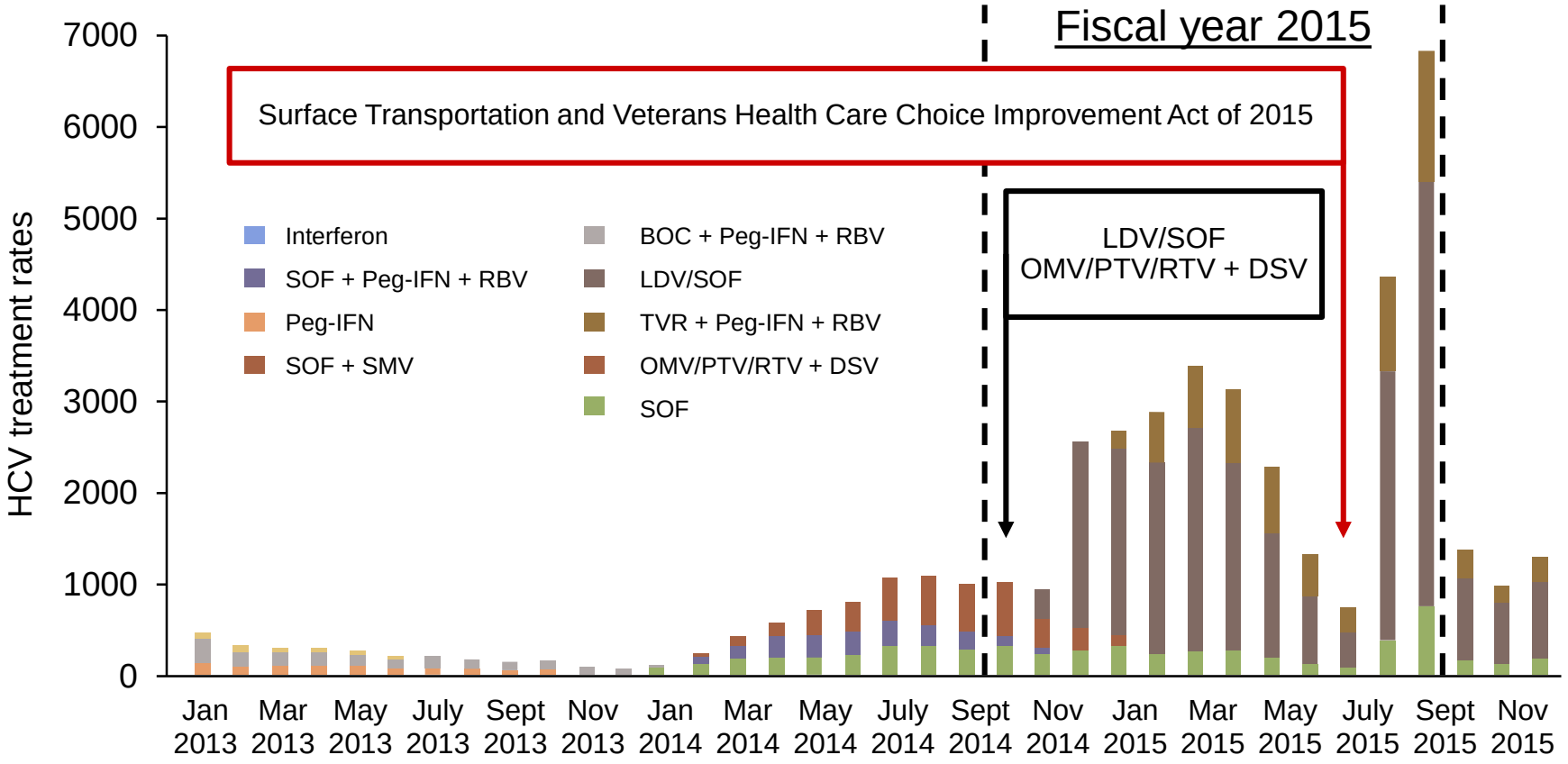

Gottfredsson F, et al. HIV and Hepatitis Nordic Conference 2016; Abstract #O5

# Global timing of hepatitis C virus elimination: Estimating the year countries will achieve the World Health Organization elimination targets




Razavi H, et al. EASL 2019, Vienna, Austria. #SAT-260

# Towards eradication of HCV infection in the Veterans Affairs National Healthcare System




**Projections are that the Veterans Affairs National Healthcare System has the capacity to cure the majority of HCV-infected veterans in ~3 years**

Moon A, et al. AASLD 2016, Oral #227

# Summary

- SVR is now possible in a broad spectrum of patients
- Pan-genotypic regimen are preferred treatment options
- We **CAN** eliminate this virus – but to do so we will need:
  - Rigorous national HCV surveillance across all countries
  - Effective screening programmes and improved linkage into care for diagnosed patients
  - Increased treatment uptake with high efficacy therapies
  - To identify and close gaps in diagnosis, treatment and infrastructure
  - Country-specific tailored disease prevention programmes
  - Target high incidence populations such as MSM, PWID, prisoners and migrants
  - Collaboration between physicians, patients, governments, NGOs and Pharma to bring about the changes required to deliver ‘cure’ to more patients

NGO: non-governmental organisation; SVR: sustained virological response