

# **APPLIED MECHANISM DESIGN FOR SOCIAL GOOD**

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Lecture #12b – 10/11/2016

**CMSC828M**

**Tuesdays & Thursdays**

**12:30pm – 1:45pm**



**COMPUTER SCIENCE**  
UNIVERSITY OF MARYLAND

# HEALTH CARE AND WALL STREET

# TRANSFORMATIVE THERAPIES

**Transformative therapies** provide drastic improvements over other treatments

- Curative therapy for Hepatitis C Virus (HCV) - 90% of infected individuals appear to be cured after 6 to 8 weeks

~\$84,000

- Gene therapy (Glybera) for a very rare lipoprotein lipase deficiency disease - Benefits can last for patient's remaining lifetime

~\$1,000,000

**Mitigators** non curative drugs that require chronic

- Lower prices, paid incrementally
- Chronic illness can lead to additional medical problems
- Disease can be transmitted to others

# HEALTHCARE LOANS

**Healthcare Loans (HCL) spread the cost of cures over many years**

- Financial institutions already offer standardized loan contracts that offer large amounts of credit that can cover medical expenses
  - Typically, large loans require some form of collateral
  - Credit-card borrowing possible for smaller loans
  - Payday loans are common among less affluent borrowers
- **62%** of all personal bankruptcies in 2007 were related to medical expenses

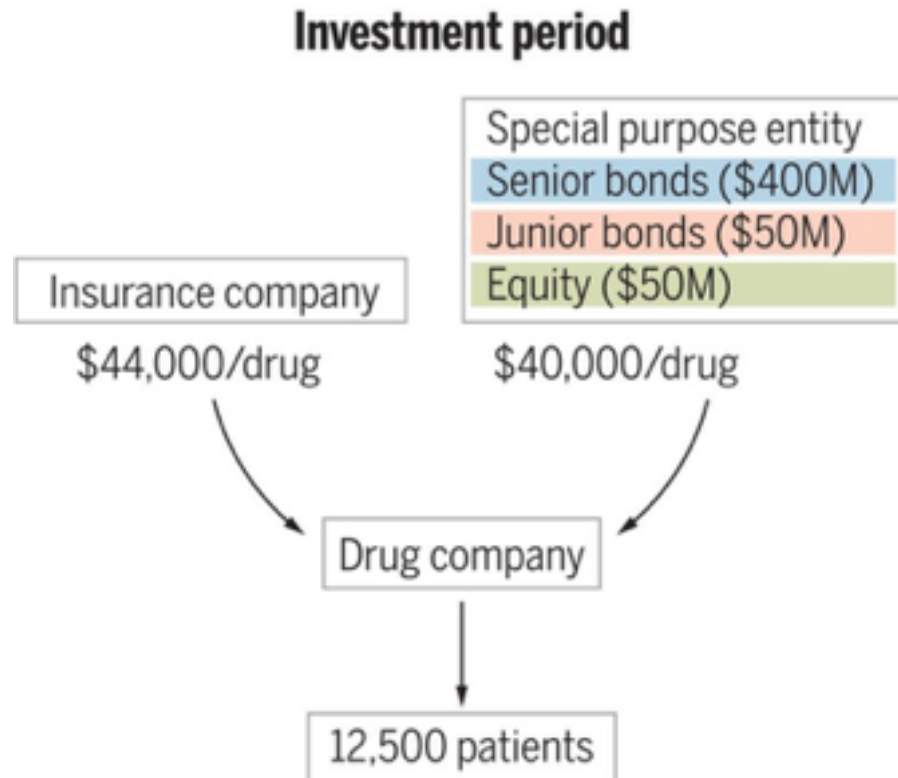
# SOLUTIONS

Short-term: using **diversification** and **securitization** reduce the risk and increase the efficiency of the market

Long-term: health insurance companies cover the cost with the legal definition of “preexisting conditions” changed to include **“financial conditions”**

# HCL FUNDS

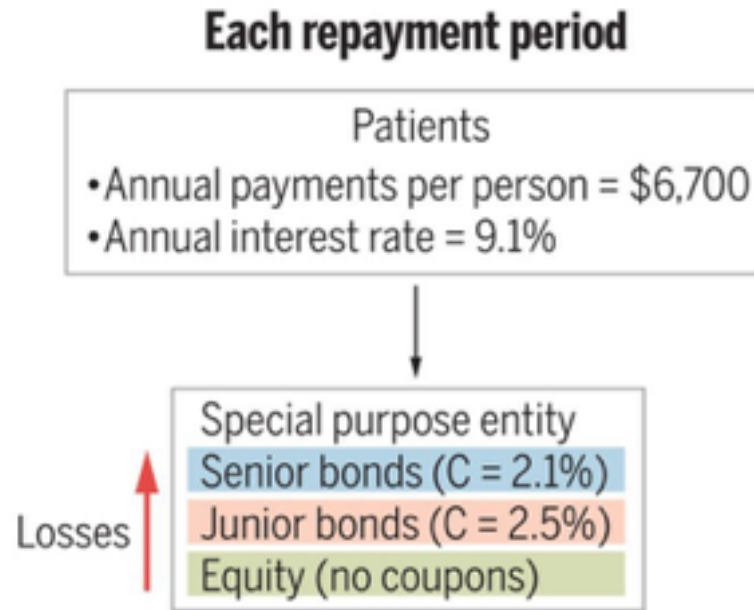
**Special purpose entity (SPE) funds expensive drug purchases and is funded by a pool of investors with various securities**



# HCL FUNDS

Patients make annual loan payments and the investors receive cash payments based on the seniority of their notes

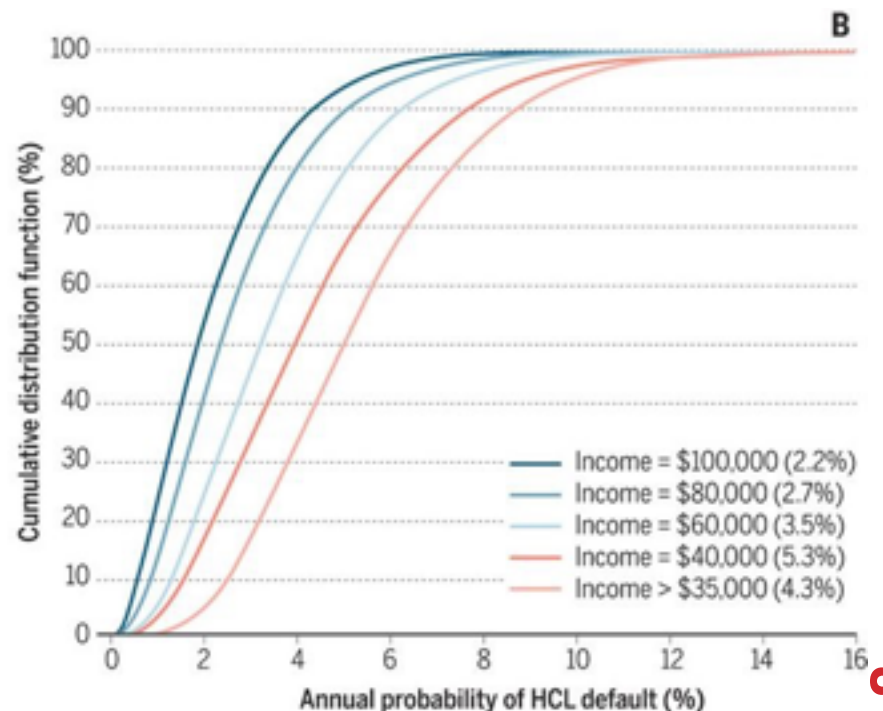
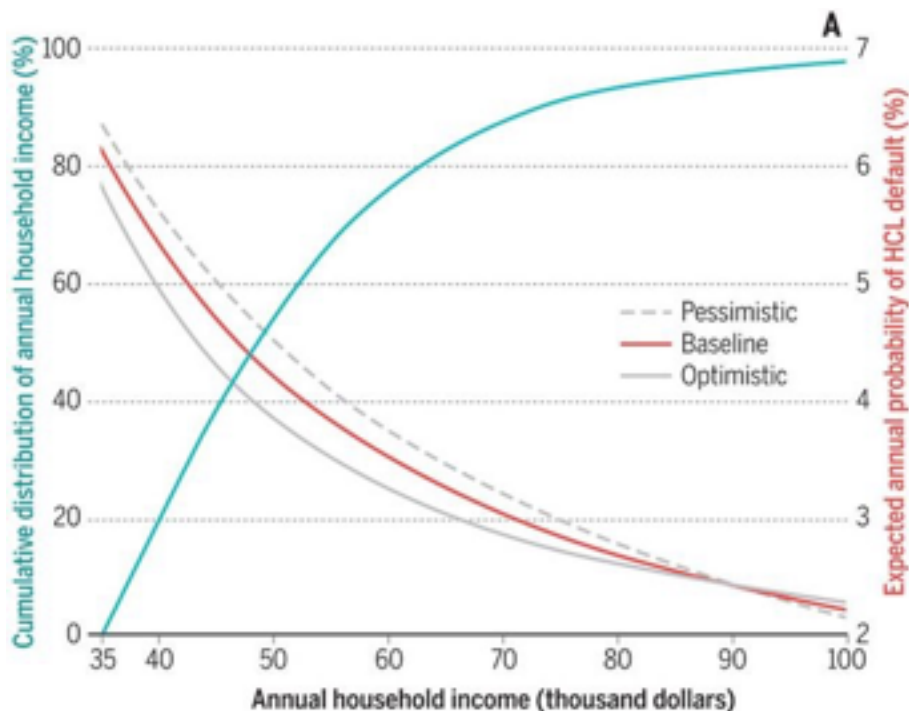
Payment continues until the debt is **repaid**, the patient or payer **defaults**, the **benefit** of the drug **ends**



# SIMULATING HCL FUNDS

Simulate financing HCV therapy payments for **12,500** patients

- Insurance pays \$44,000, \$40,000 is financed by the HCL
- Default rates were calibrated to typical values for consumer loans by borrower-income levels

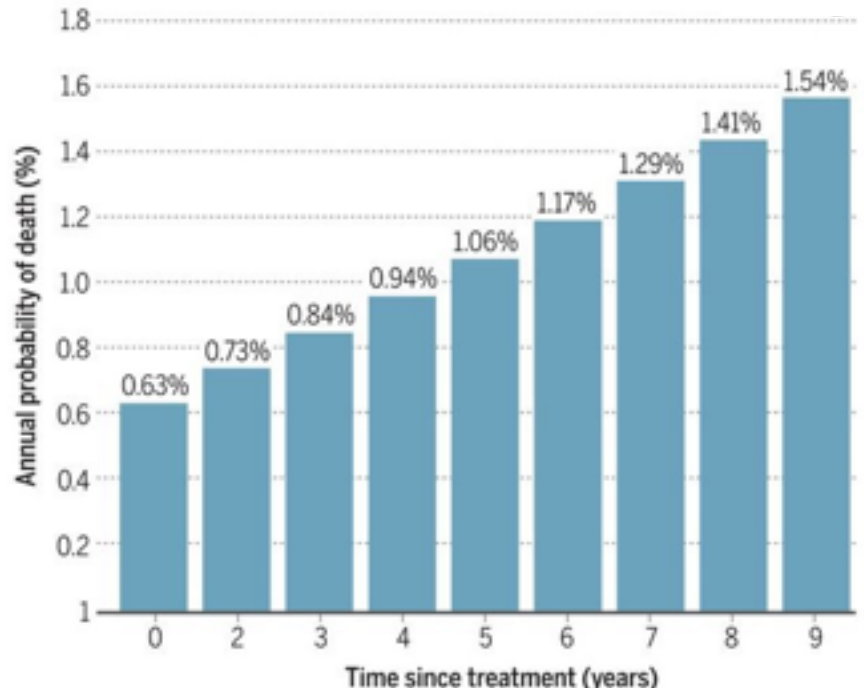
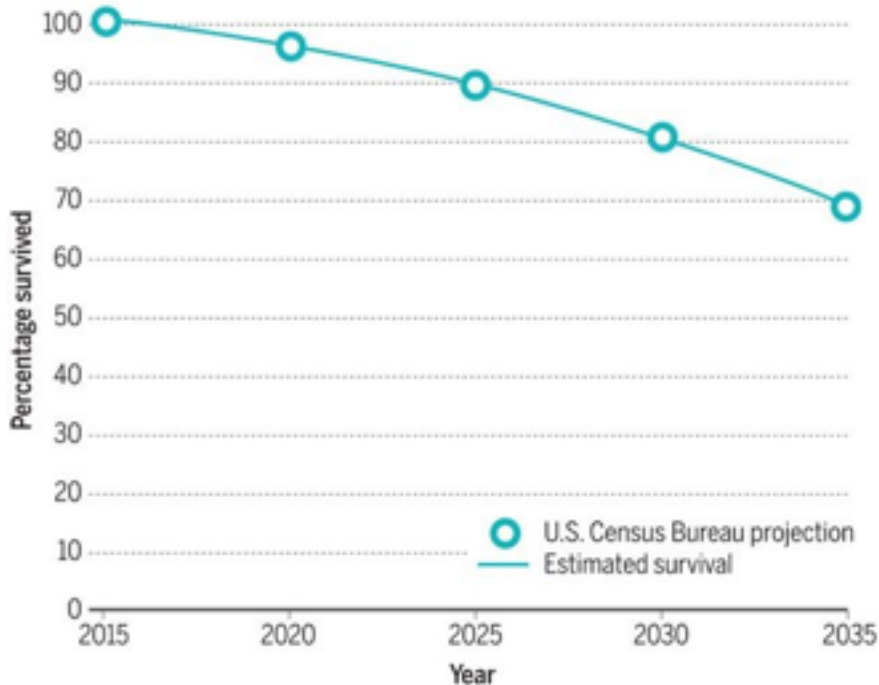




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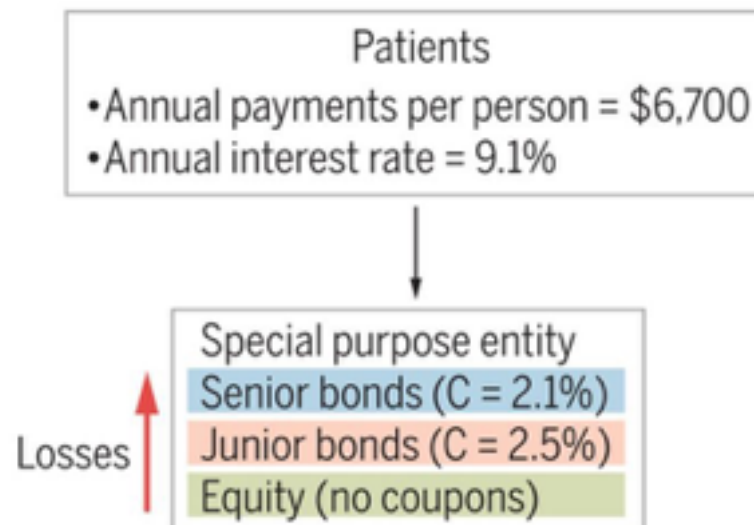


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- Individual HCLs have 9-year terms with a 9.1% annual interest

## Each repayment period



# SIMULATION RESULTS

**Risk-reward profiles across all three scenarios were within acceptable range to attract investors**

- The average and median simulated internal rate of return (IRR) was **12.5%** and **12.7%** respectively
- The standard deviation of the IRR was **3.1%**
- A similar compound annual return of the Standard & Poor's 500 index was **7.0%** with a standard deviation of **15.5%**

# ALIGNING INCENTIVES USING HCLS

Risk can be reduced by offering bondholders principal **guarantees**

- Possible guarantors are **philanthropists**, **patient advocacy groups**, **government agencies**, and **pharmaceutical companies**
- Cost to guarantee would be **0.006%** (pessimistic scenario)

Acts as a natural **hedge** for pension funds and insurance companies

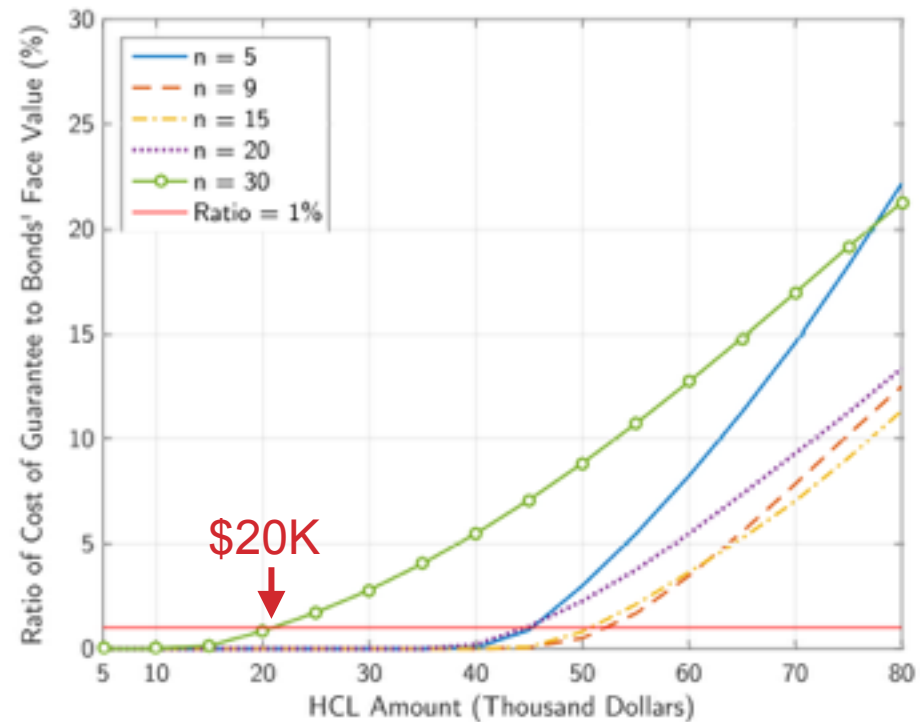
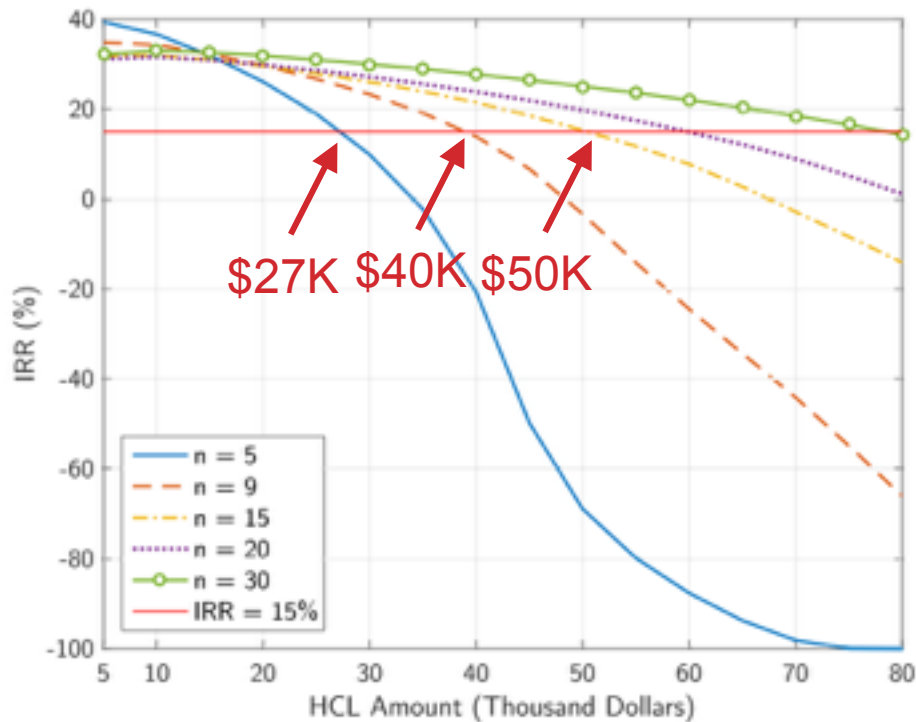
Disincentivizes release of ineffective drugs through **value-based reimbursement**

**Patients** are incentivized to adhere to prescribed regimens and avoid behaviors that undermine the treatment

Creates more options in countries with **nationalized healthcare**

# SENSITIVITY ANALYSIS

Simulation results depend critically on default rate, interest rate, economic environment, and lending practice assumptions



# ROLE OF HEALTH INSURANCE

**Long-term: Insurance companies cover the high costs of transformative therapies**

**Why don't insurance companies do this now?**



**New regulations are needed to require insurance companies to assume the remaining amortized debt of new policyholders**

# QUALIFICATIONS AND LIMITATIONS

Patients with income **<\$35K** were excluded under the assumption that many have Medicaid coverage

Results are, at best, **suggestive** because HCLs do not exist in the market, so the default characteristics may be different

Securitization can be **abused** if the **proper protections** are not present

# CONCLUSION

Financing HCLs whose repayment is linked to ongoing value with portfolio theory and securitization techniques are viable under current practical conditions

HCLs can improve access to the **best health care** for the **less affluent**

MIT Laboratory for Financial Engineering **CanceRx** 2016