A Cost-effectiveness Analysis of a Prescription and Over-the-counter Drug Take-back Program for New York State

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Outline

• Purpose

• Background Information

• Theoretical Model

• Questions and feedback
Purpose

• Introduce theoretical economic model
  • Cost-benefit design

• Human and environmental health implications

• Develop inclusive list of societal costs and benefits

• Refine model parameters
Background Information

• Purpose of economic evaluation:
  • Efficient resource allocation
  • Cost abatement
  • Prioritize public health concerns
Pharmaceuticals

• National Association of Chain Drug Stores
  • ~3.2 billion prescriptions filled in 2003
  • ~2.2 billion prescriptions filled in 1995
  • Not including OTC’s

• Prescription and OTC products identified in NY (Wilson, 2006)
  • Atenolol
  • Estrone
  • Ibuprofen
  • Carbamazepine
  • Trimethoprim
  • Caffeine

• Source:
Background Information

• Medication take back programs include:
  • One day events
  • Extended producer responsibility
  • Deposit system
One Day Events

• Several variations have been done

• Limitations:
  • Short duration
  • Participation is voluntary
  • Medication container recycling

• Sources:
  • Franklin County Pilot Unwanted Medications Collection: Senior Center, Turner Falls (Montague), Massachusetts. 9 December 2004.
Extended Producer Responsibility

• Definition:

The development of policies for the take-back, recycling, and final disposal of used products (Driedger, 2002)
An Example

• British Columbia Medications Return Program
  • Pharmaceutical manufacturers sponsor
  • Utilize community pharmacies
  • Collect unused/expired medications which are destroyed as hazardous waste
  • In 2005 collected 18,012 kg and cost $225,000 (Partridge, 2006)
Extended Producer Responsibility

• Limitations:
  • Consumer participation is voluntary
  • Medication container recycling

• Sources:
Deposit System

• Medication deposit system:
  • Consumers pay deposit on medication container
  • Receive deposit refund upon container’s return
    • Returned medications collected for disposal as hazardous waste
    • Medication container recycled

• Venue:
  • Community Pharmacies
Deposit System

- Model based upon:
  - Recyclable goods
  - Consumer behavior patterns

- Deposit system maximizes participation
  - Financial incentive
    - Increases medication return
    - Initiates medication container recycling
Deposit System

- Limitations
  - Consumer resistance
  - Agricultural agents
Deposit System

• Basic Assumptions:
  • Consumers will return unused /expired medications with deposited container
  • Demand for medications is inelastic
  • Societal perspective
    • Producer
    • Consumer
Model

• Theoretical using mathematical equations consumer & producer costs

• Consumption Methods:
  • Method X – Consumer utilizes medication and returns the container with unused / expired portions
  • Method Y – Consumer disposes of containers with unused / expired medication portions
Model

• \( R(X) \) represents recycling costs pharmacies incur from deposit system

• Comprised of:
  • Processing costs
  • Storage costs
  • Disposal costs
Model

• $S$ represents containers which are not returned

$$Q = Q(X+Y, S(X))$$

• Where:
  • $Q = \text{Quantity}$
  • $Q(X+Y) = \text{positive utility from consumption}$
  • $Q(S(X)) = \text{the inconvenience of returning containers / medications}$

• Consumer utility
Model

Marginal externality of dumping =
Marginal cost of recycling –
Marginal inconvenience cost of returning containers/medications

• Summarizes Consumer’s side
Model

• Producers side:
  • Assume single processes for production and distribution

• $Z$ represents costs which producer incurs based on amount of containers and/or medications returned

• $Z = X + Y$
Model

- Producers want to maximize profits
  - Incur costs of:
    - Recycling
    - Storage
    - Processing
  - Gain revenue:
    - Unclaimed deposits
    - Consumer patronage
Model

• Consumers will **return** containers with unused / expired medications:
  • If inconvenience costs of returning < deposit

• Consumers will **dump** containers with unused / expired medications:
  • If inconvenience costs of returning > deposit
Inelastic Demand

- **Price**
- **Demand**
- **Supply**

Points:
- $P'$
- $P''$
- $P^*$

Quantities:
- $Q'$
- $Q''$
- $Q^*$
Deposit System Analysis

- Consumers pay deposit
- Receive refund upon return
- Those who find it too inconvenient will not participate
- Uncollected deposits entice producers to participate
- Goal to maximize medication return to decrease PPCP pollution
- Limitation of consumer resistance
## Societal Costs and Benefits

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<th>Benefits</th>
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<td>Improved human health</td>
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<tr>
<td>Processing costs</td>
<td>Improved environment</td>
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<td>Recycling costs</td>
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<td>Cost of deposit</td>
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<td>Health costs</td>
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<td>Insurance costs</td>
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It's QUESTION TIME!!