ISPOR SHORT COURSES

"Budget Impact Analysis: Applications and Design Issues"

Presented by:

Stephanie Earnshaw, PhD, MS, Vice President, Health Economics, RTI Health Solutions, Research Triangle Park, NC, USA

Anita Brogan, PhD, Head, Decision-Analytic Modeling, Health Economics, RTI Health Solutions, Research Triangle Park, NC, USA

Emily Reese, PhD, MPH, Senior Research Health Economist, RTI Health Solutions, Research Triangle Park, NC, USA

Josephine Mauskopf, PhD, Vice President, Health Economics, RTI Health Solutions, Research Triangle Park, NC, USA

C. Daniel Mullins, PhD, Professor, Pharmaceutical Health Services Research, University of Maryland School of Pharmacy, Baltimore, MD, USA

Sunday, June 1, 2014

Before Starting Course

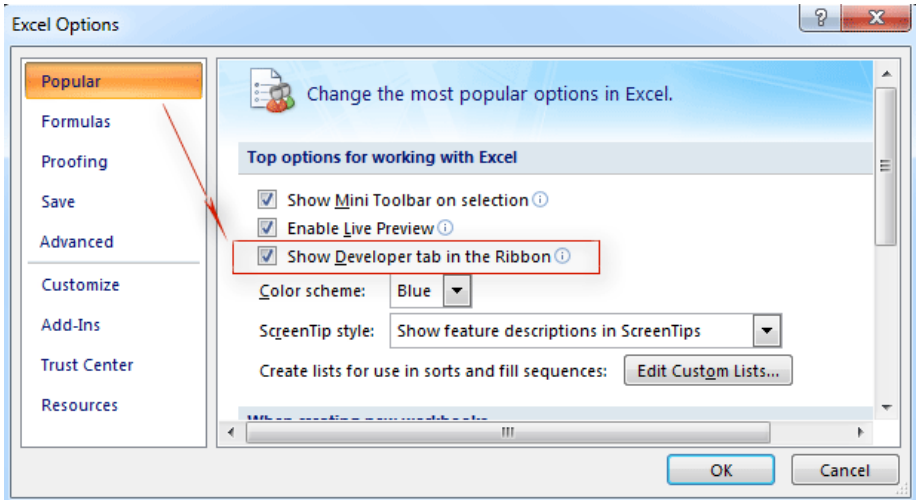
- Ensure Developer ribbon is visible in Microsoft Excel (see following slides)
- Check security settings (see following slides)
- You should have the Excel-based budget impact model for this course loaded on your laptop
  - If you do not have the Excel-based budget impact model loaded on your laptop, please find one of the course instructors to get a copy
  - Save at least two copies of the Excel-based budget impact model on your desktop
  - Always save each copy of the model in .xlsm format
- Get into groups of 2-3 people

See supplementary course materials

Steps for Showing Developer Ribbon in Excel

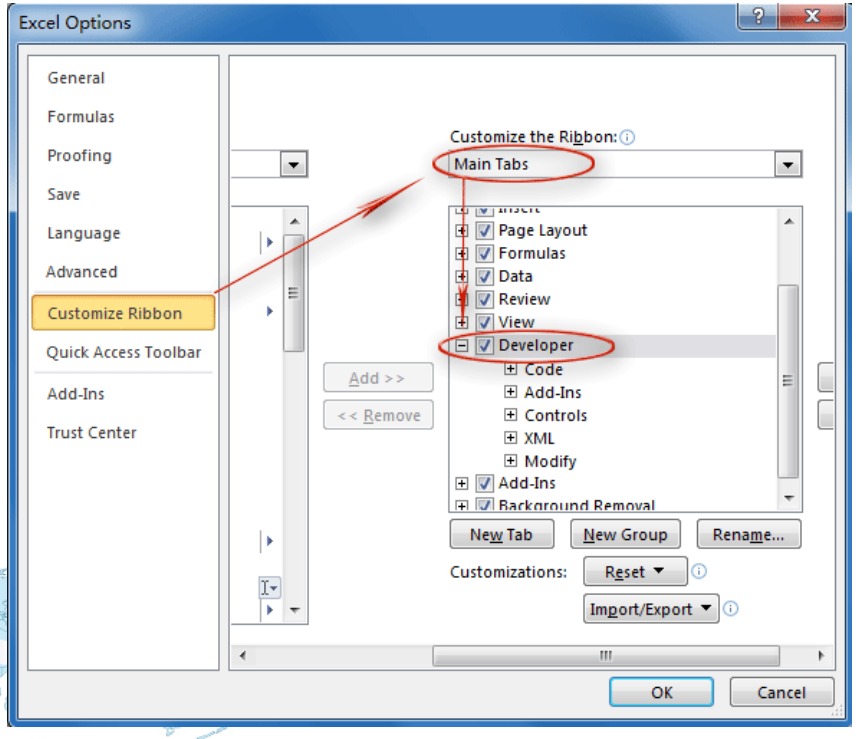
For Office 2007

1. Open a new Excel file
2. Click the Office Button
3. Excel Options
4. Popular
5. Select “Show Developer tab in the ribbon”



For Office 2010

1. Open a new Excel file
2. Click on File
3. Options
4. Customize Ribbon
5. Select “Developer”

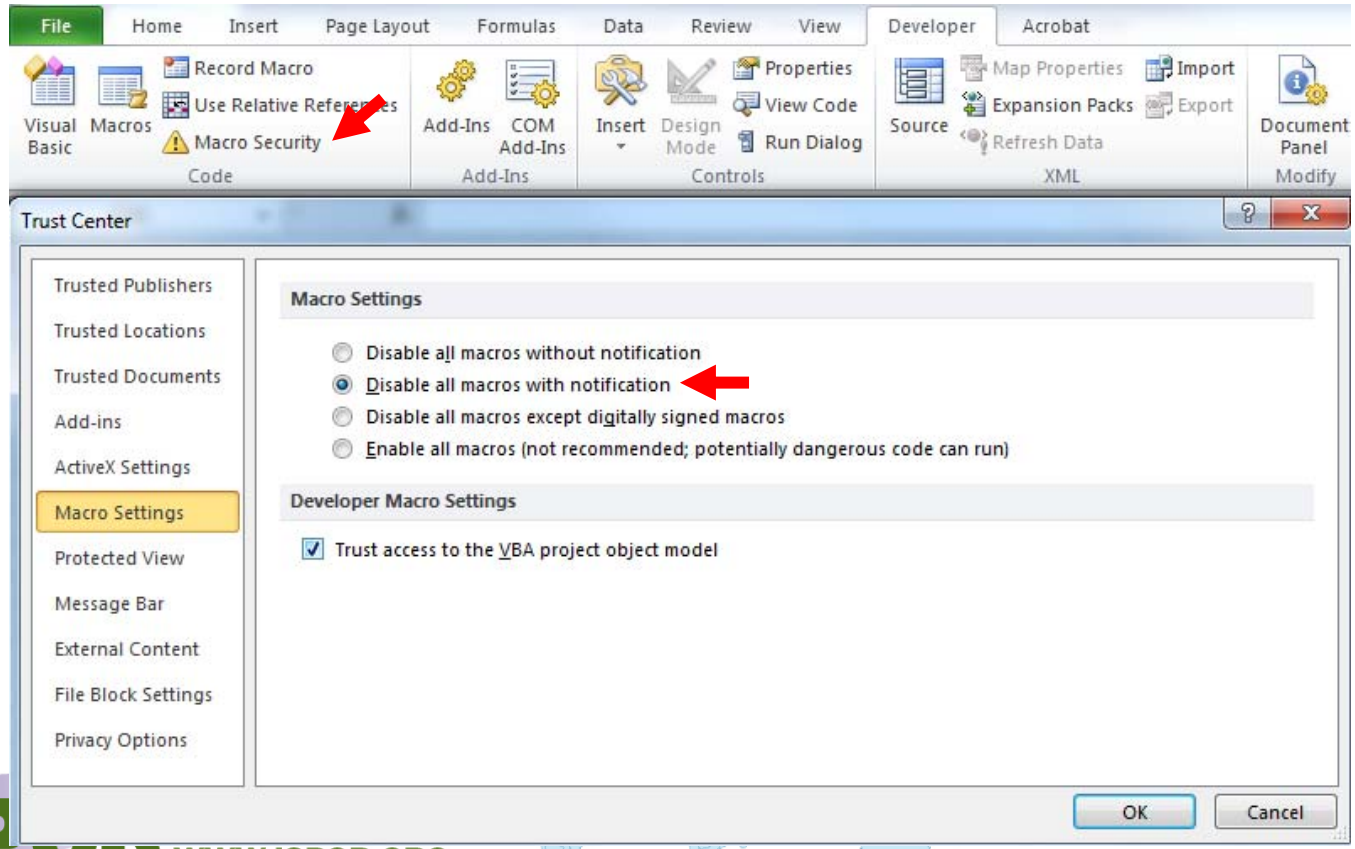


See supplementary course materials

Enabling Macro Security in Excel

For Office 2007 and Office 2010

1. In the Developer ribbon, click on “Macro Security”
2. Select “Disable all macros with notifications”



Objectives for the Course

By the end of the workshop, you should be able to:

- Understand and interpret an Excel-based budget impact analysis
- Modify an existing budget impact analysis based on new evidence or needs
- Learn good practices for developing budget impact analyses in Excel

Structure of the Course

- Introduction to budget impact analyses
- Review the six-step process for budget impact analysis
- Review a budget impact analysis that was developed in Excel
- Interpret results and run scenarios within the current budget impact analysis
- Revise the budget impact analysis to incorporate new features
- Review good practices for budget impact analyses
- Wrap up

Introduction to Budget Impact Analysis

Why Perform a BIA?

- Budget Impact Analysis (BIA) is an essential part of a comprehensive economic assessment of a health care technology
- BIA is increasingly required, along with cost-effectiveness analysis (CEA), prior to formulary approval or reimbursement

Why Perform a BIA?

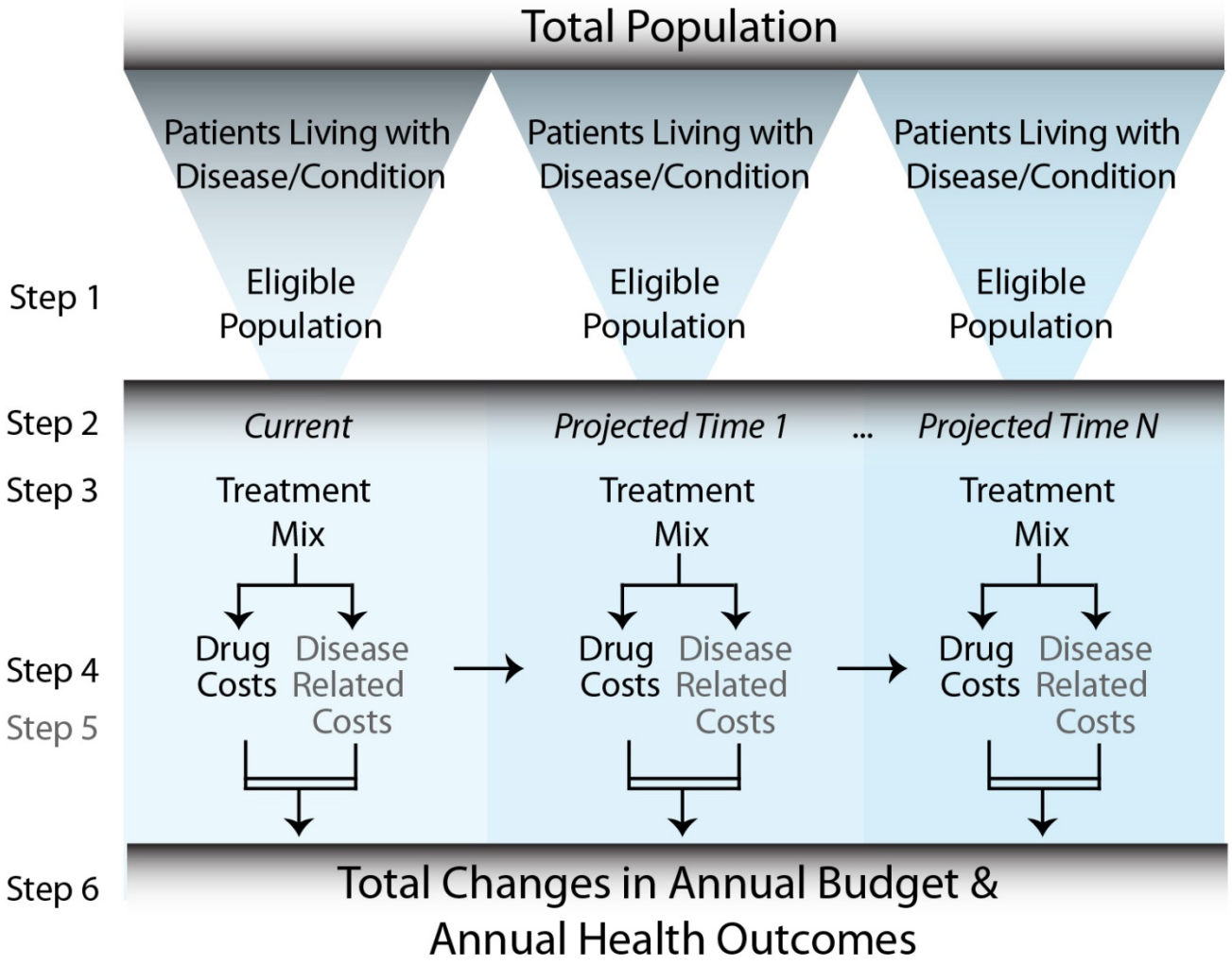
- BIA provides a valid computing framework that allows users to see how different assumptions about the diffusion of a new technology in the health plan will result in
  - Changes in the mix of treatments used for a specific condition
  - Changes in the costs of treating a specific condition
  - Changes in health outcomes for a specific condition
- BIA is useful for budget planning and forecasting
  - The results of the BIA will vary depending on the decision maker perspective

CEA versus BIA

Analysis Approach	Population Studied	Time Span	Example Outcome Measures	Value to Decision Maker
Cost-Effectiveness Analysis	One-year incidence cohort or representative individual	Disease duration	• Incremental lifetime costs • Incremental life years • Cost per QALY gained	• Resource allocation decisions among different treatments
Budget Impact Analysis	All people with disease in one-year time period	One year/ annual	• Annual change in health care costs • Annual change in mortality or morbidity	• Budget planning • Reaching target health outcomes

Review the Six Step Process for Budget Impact Analysis

Six Steps for Estimating the Budget Impact



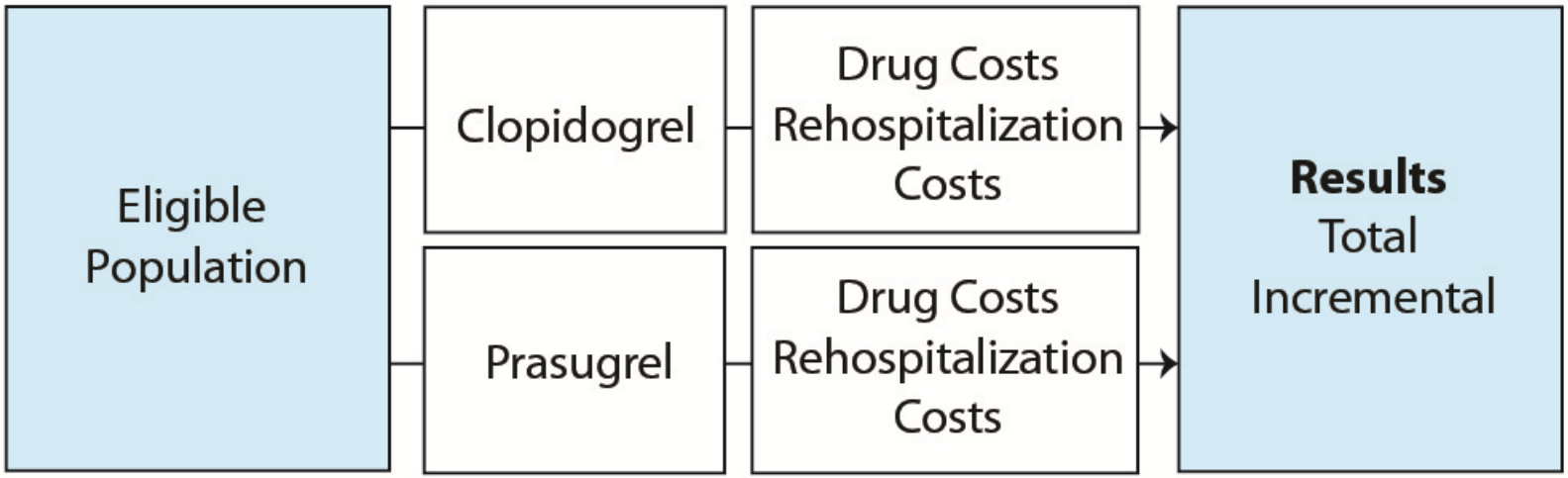
Six Steps

- Step 1: Characterize Population
- Step 2: Select Time Horizon
- Step 3: Estimate Current and Future Treatment Mix
- Step 4: Estimate Drug Costs
- Step 5: Estimate Changes in Disease-Related Costs
- Step 6: Present Budget Impacts and Health Outcomes

Review a Budget Impact Analysis that Was Developed in Excel

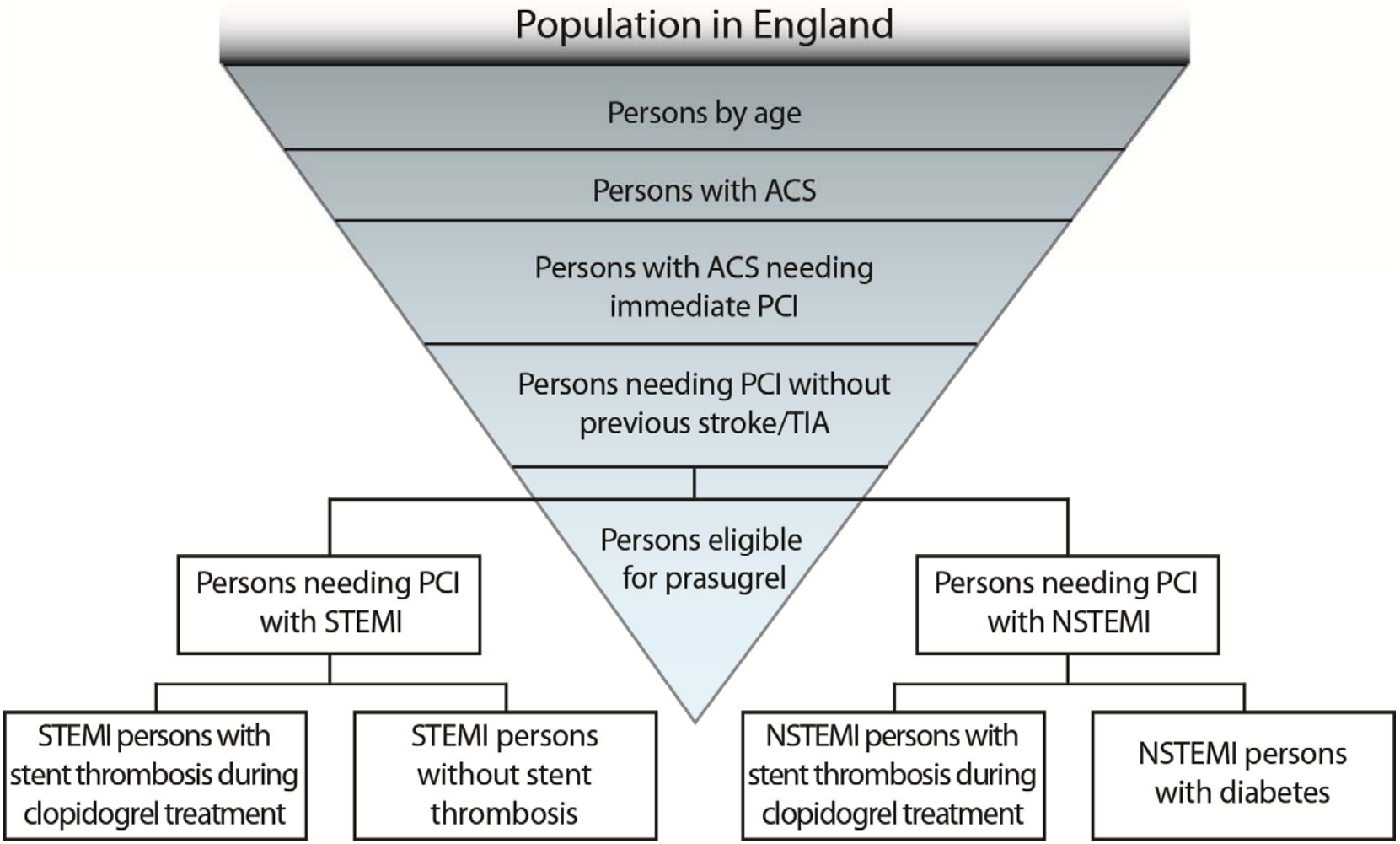
*Static Model: Prasugrel**

- Simple static cost calculator model
- Patients with ACS needing PCI
- Time horizon: one year
- Disease-related costs are proxied by 1-year rehospitalization
- No discounting



**Adapted from NICE model. NICE template was edited and augmented.*

*Step 1: Characterize Population**



**Adapted from NICE model. NICE template was edited and augmented.*
STEMI = ST-segment elevation MI; NSTEMI = non–ST-segment elevation MI.

Step 2: Select Time Horizon

- One-year time horizon
- Results presented for current year (year 1)
- Results presented for future years with projected uptake: year 2, year 3, year 4, and year 5

Step 3: Current and Future Treatment Mix

Patient Subgroup	Current Year	Year 2	Year 3	Year 4	Year 5
STEMI with Stent Thrombosis					
Prasugrel	0%	100%	100%	100%	100%
Clopidogrel	100%	0%	0%	0%	0%
All Other STEMI					
Prasugrel	0%	20%	30%	50%	70%
Clopidogrel	100%	80%	70%	50%	30%
NSTEMI with Stent Thrombosis					
Prasugrel	0%	100%	100%	100%	100%
Clopidogrel	100%	0%	0%	0%	0%
NSTEMI with Diabetes					
Prasugrel	0%	20%	30%	50%	70%
Clopidogrel	100%	80%	70%	50%	30%

Step 4: Estimate Drug Costs

- Static model so patients are not assumed to age through the model
- No allowances for generic forms

Parameter	Value	Source/Assumption
Clopidogrel		
Loading dose 300 mg	£5.04	British national formulary 57 (2009)
75 mg 30-tablet pack	£37.83	
Prasugrel		
Loading dose 60 mg	£10.20	Price of prasugrel from manufacturer's submission (2009)
10 mg 28-tablet pack*	£47.56	

**Cost is weighted to allow 5 mg dose for patients 75+ years of age or weighing less than 60 kg. Drug unit costs represents weighted average.*

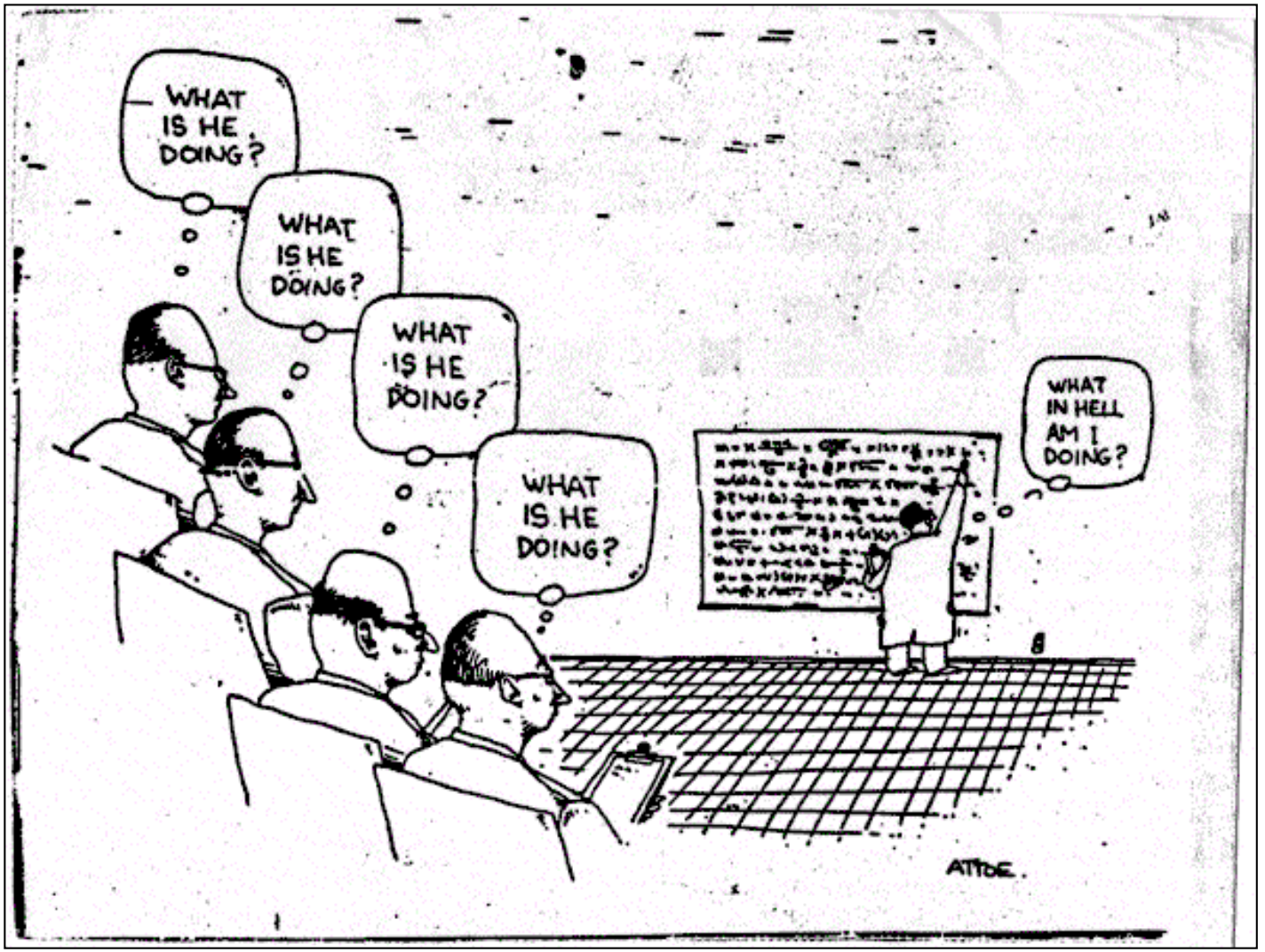
Step 5: Estimate Changes in Disease-Related Costs

- Patients on prasugrel in clinical trial versus clopidogrel had a lower rehospitalization rate in year after ACS/PCI
- Analysis includes number of rehospitalizations and cost per rehospitalization

Parameter	Value	Source/Assumption
Rehospitalization rate for clopidogrel patients	0.377	Mahoney et al (2010)
Reduction in rate of rehospitalization with prasugrel	0.0087	Daiichi-Sankyo (2009) Eli Lilly and Company Ltd STA submission
Cost of rehospitalization	£5,345	NHS mandatory tariff 2009/10 and reference costs 2007–08

Step 6: Present Budget Impact and Health Outcomes

Outcome	Current Year	Year 2	Year 3	Year 4	Year 5
Cost Outcomes					
Drug Total Costs	£6,447,553	£7,046,901	£7,274,208	£7,728,821	£8,183,434
Clopidogrel	£6,447,553	£4,849,271	£4,243,112	£3,030,794	£1,818,477
Prasugrel	£0	£2,197,631	£3,031,096	£4,698,027	£6,364,958
Rehospitalization Costs	£28,424,710	£28,264,360	£28,200,220	£28,077,285	£27,954,350
Total Costs	**£34,872,263**	**£35,311,261**	**£35,474,428**	**£35,806,106**	**£36,137,784**
Change in Costs					
Drug Budget		£599,348	£826,655	£1,281,268	£1,735,881
Rehospitalization Costs		-£160,350	-£224,490	-£347,425	-£470,360
Total Costs		£438,998	£602,165	£933,843	£1,265,521
Health Outcomes					
Number of Rehospitalizations	5,318	5,288	5,276	5,253	5,230
Rehospitalizations Avoided		30	42	65	88


WHAT IS HE DOING?
WHAT IS HE DOING?
WHAT IS HE DOING?
WHAT IS HE DOING?
WHAT IN HELL AM I DOING?

Review Excel File

Interpret Results and Run Scenarios within the Current Budget Impact Analysis

Question 1

- What is the impact of prasugrel use on the pharmacy budget?

Question 1 Solution

- What is the impact of prasugrel use on the pharmacy budget?

Budget Impact: Tabular Results

Outcome	Current Year	Year 2	Year 3	Year 4	Year 5
Cost Outcomes					
Drug Costs	£6,447,553	£7,046,901	£7,274,208	£7,728,821	£8,183,434
Clopidogrel	£6,447,553	£4,849,271	£4,243,112	£3,030,794	£1,818,477
Prasugrel	£0	£2,197,631	£3,031,096	£4,698,027	£6,364,958
Rehospitalization Costs	£28,424,710	£28,264,360	£28,200,220	£28,077,285	£27,954,350
Total Costs	**£34,872,263**	**£35,311,261**	**£35,474,428**	**£35,806,106**	**£36,137,784**
Change in Costs					
Drug Costs		£599,348	£826,655	£1,281,268	£1,735,881
Rehospitalization Costs		-£160,350	-£224,490	-£347,425	-£470,360
Total Costs		£438,998	£602,165	£933,843	£1,265,521
Health Outcomes					
Number of Rehospitalizations	5,318	5,288	5,276	5,253	5,230
Rehospitalizations Avoided		30	42	65	88

Question 2

- What are the total costs in the current year and in Year 5?

- What is the impact on payer budgets of prasugrel use?

Question 2 Solution

What are the total costs in the current year and in Year 5?

Budget Impact: Tabular Results

Outcome	Current Year	Year 2	Year 3	Year 4	Year 5
Cost Outcomes					
Drug Costs	£6,447,553	£7,046,901	£7,274,208	£7,728,821	£8,183,434
Clopidogrel	£6,447,553	£4,849,271	£4,243,112	£3,030,794	£1,818,477
Prasugrel	£0	£2,197,631	£3,031,096	£4,698,027	£6,364,958
Rehospitalization Costs	£28,424,710	£28,264,360	£28,200,220	£28,077,285	£27,954,350
Total Costs	**£34,872,263**	**£35,311,261**	**£35,474,428**	**£35,806,106**	**£36,137,784**
Change in Costs					
Drug Costs		£599,348	£826,655	£1,281,268	£1,735,881
Rehospitalization Costs		-£160,350	-£224,490	-£347,425	-£470,360
Total Costs		£438,998	£602,165	£933,843	£1,265,521
Health Outcomes					
Number of Rehospitalizations	5,318	5,288	5,276	5,253	5,230
Rehospitalizations Avoided		30	42	65	88

Question 2 Solution

What is the impact on payer budgets of prasugrel use?

Budget Impact: Tabular Results

Outcome	Current Year	Year 2	Year 3	Year 4	Year 5
Cost Outcomes					
Drug Costs	£6,447,553	£7,046,901	£7,274,208	£7,728,821	£8,183,434
Clopidogrel	£6,447,553	£4,849,271	£4,243,112	£3,030,794	£1,818,477
Prasugrel	£0	£2,197,631	£3,031,096	£4,698,027	£6,364,958
Rehospitalization Costs	£28,424,710	£28,264,360	£28,200,220	£28,077,285	£27,954,350
Total Costs	**£34,872,263**	**£35,311,261**	**£35,474,428**	**£35,806,106**	**£36,137,784**
Change in Costs					
Drug Costs		£599,348	£826,655	£1,281,268	£1,735,881
Rehospitalization Costs		-£160,350	-£224,490	-£347,425	-£470,360
Total Costs		£438,998	£602,165	£933,843	£1,265,521
Health Outcomes					
Number of Rehospitalizations	5,318	5,288	5,276	5,253	5,230
Rehospitalizations Avoided		30	42	65	88

Prasugrel use increases drug costs but reduces rehospitalization costs.

Question 3

- What are the health benefits associated with this budget increase?

Question 3 Solution

- What are the health benefits associated with this budget increase?

Budget Impact: Tabular Results

Outcome	Current Year	Year 2	Year 3	Year 4	Year 5
Cost Outcomes					
Drug Costs	£6,447,553	£7,046,901	£7,274,208	£7,728,821	£8,183,434
Clopidogrel	£6,447,553	£4,849,271	£4,243,112	£3,030,794	£1,818,477
Prasugrel	£0	£2,197,631	£3,031,096	£4,698,027	£6,364,958
Rehospitalization Costs	£28,424,710	£28,264,360	£28,200,220	£28,077,285	£27,954,350
Total Costs	**£34,872,263**	**£35,311,261**	**£35,474,428**	**£35,806,106**	**£36,137,784**
Change in Costs					
Drug Costs		£599,348	£826,655	£1,281,268	£1,735,881
Rehospitalization Costs		-£160,350	-£224,490	-£347,425	-£470,360
Total Costs		£438,998	£602,165	£933,843	£1,265,521
Health Outcomes					
Number of Rehospitalizations	5,318	5,288	5,276	5,253	5,230
Rehospitalizations Avoided		30	42	65	88

Question 4

- Suppose you wanted to take the perspective of one of the drugs. What value messages could be taken from the model?

Question 4 Solution

- Suppose you wanted to take the perspective of one of the drugs. What value messages could be taken from the model?
  - Prasugrel
    - Reimbursing patients for prasugrel may reduce the number of rehospitalizations
    - Reimbursing patients for prasugrel is expected to increase drug costs, but these increases may be partially offset by lower rehospitalization costs
  - Clopidogrel
    - Reimbursing patients for prasugrel may shift patients away from using clopidogrel. This shift may be associated with a substantial increase in total costs (over £1.2 million [3.6%] in the UK) with only marginal health benefits (88 rehospitalizations avoided [1.7%]).

Customize the Budget Impact Analysis for Your Population

Question 1

Suppose you need to customize the model with data from your own plan. How would you make the following change?

- In your plan, the percentage of people with ACS in whom immediate percutaneous coronary intervention (PCI) is necessary is 24%

Question 1 Solution

Population Worksheet

Patients Living with Disease/Condition

Parameter	Age Groups			Source/Assumption
	<35	35-75	75+	
Population of England by age group	22,263,025	24,365,697	3,913,783	Office for National Statistics population estimates by primary care organisation 2006.
Total population in England		50,542,505		
Estimated annual incidence of acute coronary syndrome (ACS), by age group	0.0%	0.6%	2.3%	<35: Model assumed incidence to be negligible. 35-75: Incidence calculated from Taylor et al., 2007. 75+: Incidence calculated based on HES 2007-08 data (codes I20.0 to I22.9).
Number of people diagnosed with ACS each year, by age group	0	144,525	89,089	Main et al. (2004) Population by age group, multiplied by annual incidence.
Total number of people diagnosed with ACS each year		233,614		
Percentage of people with ACS in whom immediate percutaneous coronary intervention (PCI) is necessary		24.0%		Ludman, 2007.

Percentage of people with ACS in whom PCI is necessary was originally 16.0%

Budget Impact: Tabular Results

Outcome	Current Year	Year 2	Year 3	Year 4	Year 5
Cost Outcomes					
Drug Costs	£9,657,990	£10,555,772	£10,896,261	£11,577,241	£12,258,220
Clopidogrel	£9,657,990	£7,263,873	£6,355,889	£4,539,921	£2,723,952
Prasugrel	£0	£3,291,899	£4,540,373	£7,037,320	£9,534,267
Rehospitalization Costs	£42,578,270	£42,332,400	£42,241,535	£42,059,805	£41,872,730
Total Costs	**£52,236,260**	**£52,888,172**	**£53,137,796**	**£53,637,046**	**£54,130,950**
Change in Costs					
Drug Costs		£897,782	£1,238,272	£1,919,251	£2,600,230
Rehospitalization Costs		-£245,870	-£336,735	-£518,465	-£705,540
Total Costs		£651,912	£901,537	£1,400,786	£1,894,690
Health Outcomes					
Number of Rehospitalizations	7,966	7,920	7,903	7,869	7,834
Rehospitalizations Avoided		46	63	97	132

Question 2

Suppose you need to customize the model with data from your own plan. How would you make the following change?

- In your plan, the percentage of people in whom stent thrombosis has occurred during clopidogrel treatment differs between people with STEMI (3.7%) and NSTEMI (2.2%)

Question 2 Solution

Population Worksheet

Patient Subgroups Eligible for Drug

Parameter	STEMI	NSTEMI	Source/Assumption
Percentage of eligible patients who have ST-segment elevation myocardial infarction (STEMI)	24.6%	75.4%	Ludman, 2007. Figures taken from manufacturer's submission.
Number of people with STEMI/non ST-segment myocardial infarction (NSTEMI) eligible for prasugrel treatment	13,241	40,584	Total number of people eligible for prasugrel, multiplied by the percentage with STEMI versus NSTEMI.
Percentage of people with STEMI/NSTEMI in whom stent thrombosis has occurred during clopidogrel treatment	3.70%	2.20%	TRITON-TIMI 38 Evidence Review Group, 2009; NICE, 2009. The model assumes the same percentage applies to STEMI and NSTEMI patients receiving clopidogrel treatment.
Number of people with STEMI/NSTEMI in whom stent thrombosis has occurred during clopidogrel treatment	490	893	Individuals who have had a stent thrombosis while taking clopidogrel are more likely to use prasugrel than other people with STEMI/NSTEMI.
Estimated percentage of people with NSTEMI who have diabetes mellitus		17.5%	Ludman, 2007.

Percentage of people with STEMI/NSTEMI in whom stent thrombosis has occurred during clopidogrel treatment was originally 2.35%

Budget Impact: Tabular Results

Outcome	Current Year	Year 2	Year 3	Year 4	Year 5
Cost Outcomes					
Drug Costs	£6,432,228	£7,041,218	£7,266,601	£7,717,367	£8,168,133
Clopidogrel	£6,432,228	£4,808,236	£4,207,206	£3,005,147	£1,803,088
Prasugrel	£0	£2,232,982	£3,059,394	£4,712,219	£6,365,045
Rehospitalization Costs	£28,355,225	£28,189,530	£28,130,735	£28,007,800	£27,884,865
Total Costs	**£34,787,453**	**£35,230,748**	**£35,397,336**	**£35,725,167**	**£36,052,998**
Change in Costs					
Drug Costs		£608,989	£834,372	£1,285,139	£1,735,905
Rehospitalization Costs		-£165,695	-£224,490	-£347,425	-£470,360
Total Costs		£443,294	£609,882	£937,714	£1,265,545
Health Outcomes					
Number of Rehospitalizations	5,305	5,274	5,263	5,240	5,217
Rehospitalizations Avoided		31	42	65	88

ISPOR WWW.ISPOR.ORG

Question 3

Suppose you need to customize the model with data from your own plan. How would you make the following change?

- In your plan, the expected uptake of prasugrel among people with STEMI and without stent thrombosis during clopidogrel treatment is projected to be only 40% by Year 5

Question 3 Solution

Treatment Mix Worksheet

Treatment Mix

NICE recommends prasugrel for three subgroups of people who have ACS and who require immediate primary PCI: 1) all people with STEMI, 2) people in whom stent thrombosis has occurred during clopidogrel treatment, and 3) people with diabetes mellitus. For people in whom stent thrombosis has occurred during clopidogrel treatment (with STEMI or NSTEMI), prasugrel use is assumed to be 100%.

Parameter	Current Year	Year 2	Year 3	Year 4	Year 5
STEMI with stent thrombosis during clopidogrel treatment					
Prasugrel	0%	100%	100%	100%	100%
Clopidogrel	100%	0%	0%	0%	0%
All other STEMI					
Prasugrel	0%	10%	20%	30%	40%
Clopidogrel	100%	90%	80%	70%	60%
Number of people with STEMI who receive prasugrel	*0*	*1,071*	*1,934*	*2,797*	*3,660*

As expected, costs don't go up as much as before, but we don't avoid as many rehospitalizations.

Budget Impact: Tabular Results

Outcome	Current Year	Year 2	Year 3	Year 4	Year 5
Cost Outcomes					
Drug Costs	£6,447,553	£6,898,952	£7,126,259	£7,432,923	£7,739,587
Clopidogrel	£6,447,553	£5,243,807	£4,637,648	£3,819,867	£3,002,086
Prasugrel	£0	£1,655,145	£2,488,610	£3,613,055	£4,737,500
Rehospitalization Costs	£28,424,710	£28,301,775	£28,242,980	£28,157,460	£28,071,940
Total Costs	**£34,872,263**	**£35,200,727**	**£35,369,239**	**£35,590,383**	**£35,811,527**
Change in Costs					
Drug Costs		£451,399	£678,705	£985,369	£1,292,033
Rehospitalization Costs		-£122,935	-£181,730	-£267,250	-£352,770
Total Costs		£328,464	£496,975	£718,119	£939,263
Health Outcomes					
Number of Rehospitalizations	5,318	5,295	5,284	5,268	5,252
Rehospitalizations Avoided		23	34	50	66

Question 4

Suppose you need to customize the model with data from your own plan. How would you make the following change?

- In your plan, the payer reimbursements for clopidogrel and prasugrel are lower than in the current model: 10% lower for clopidogrel, 20% lower for prasugrel

Question 4 Solution

Costs Worksheet

Drug Costs

Parameter	Unit Cost	Units per Year	Annual Cost	Sources/Assumptions
Clopidogrel				
People under 75 years				
Loading dose (300 mg)	£4.54	1	£4.54	Price of clopidogrel from British National Formulary 57 (2009). Loading dose for people under 75 years of age is 300 mg (4 tablets of 75 mg each). Regular daily dose is 75 mg regardless of age.
Per prescription (30-tablet pack with daily dose of 75 mg)	£34.05	12	£408.56	
People aged 75 and over				
Per prescription (30-tablet pack with daily dose of 75 mg)	£34.05	12	£408.56	
Prasugrel				
Loading dose (60 mg)	£8.16	1	£8.16	Price of prasugrel from manufacturer's submission (2009). Loading dose is 60 mg (6 tablets of 10 mg each). Regular daily dose is 10 mg; patients 75+ years of age or weighing less than 60 kg receive 5 mg daily. Unit cost represents weighted average.
Per prescription (28-tablet pack with daily dose of 5 or 10 mg)	£38.05	13	£494.62	

Budget Impact: Tabular Results

Outcome	Current Year	Year 2	Year 3	Year 4	Year 5
Cost Outcomes					
Drug Costs	£5,802,798	£6,122,448	£6,243,678	£6,486,136	£6,728,595
Clopidogrel	£5,802,798	£4,364,344	£3,818,801	£2,727,715	£1,636,629
Prasugrel	£0	£1,758,104	£2,424,877	£3,758,422	£5,091,966
Rehospitalization Costs	£28,424,710	£28,264,360	£28,200,220	£28,077,285	£27,954,350
Total Costs	**£34,227,508**	**£34,386,808**	**£34,443,898**	**£34,563,421**	**£34,682,945**
Change in Costs					
Drug Costs		£319,650	£440,880	£683,338	£925,797
Rehospitalization Costs		-£160,350	-£224,490	-£347,425	-£470,360
Total Costs		£159,300	£216,390	£335,913	£455,437
Health Outcomes					
Number of Rehospitalizations	5,318	5,288	5,276	5,253	5,230
Rehospitalizations Avoided		30	42	65	88

ISPOR WWW.ISPO

Discussion Topics for Updates to the Current Budget Impact Analysis

Discussion Topic 1

- This model was developed by NICE for the UK. What would you need to change on each worksheet to adapt this model to the US?

Discussion Topic 1 Solution

- This model was developed by NICE for the UK. What would you need to change on each worksheet to adapt this model to the US?
  - Population worksheet:
    - Update incidence/prevalence numbers to be US based
    - Account for commercial/Medicare Part D patients
  - Treatment Mix worksheet:
    - Get projections for US population

Discussion Topic 1 Solution

- This model was developed by NICE for the UK. What would you need to change on each worksheet to adapt this model to the US?
  - Costs worksheet:
    - Include copayments/rebates
    - Adjust £ for $
    - Get US drug and rehospitalization costs
  - Results worksheet:
    - Adjust £ for $
    - May want to include per member per month results in addition to total annual

Discussion Topic 2

- This BIA for prasugrel was developed by NICE to present the budget impact among the approved reimbursed population. How might the population/population subgroups be presented from the drug company perspective given that
  - The reimbursed population is still “to be determined”
  - The manufacturer wants to be transparent, direct realistic reimbursement, but not limit reimbursement?

Discussion Topic 2 Solution

- This BIA for prasugrel was developed by NICE to present the budget impact among the approved reimbursed population. How might the population/population subgroups be presented from the drug company perspective given that
  - The reimbursed population is still “to be determined”
  - The manufacturer wants to be transparent, direct realistic reimbursement, but not limit reimbursement?
    - Based on evidence collected from the manufacturer, determine the desired reimbursement population

Discussion Topic 2 Solution

- This BIA for prasugrel was developed by NICE to present the budget impact among the approved reimbursed population. How might the population/population subgroups be presented from the drug company perspective given that
  - The reimbursed population is still “to be determined”
  - The manufacturer wants to be transparent, direct realistic reimbursement, but not limit reimbursement?
    - Population worksheet:
      - Edit worksheet to identify the base population
      - Identify population subgroups (e.g., STEMI with previous stent thrombosis, other STEMI, NSTEMI with previous stent thrombosis, NSTEMI with diabetes, other NSTEMI) that may be of interest for scenario analyses. Setup worksheet to easily identify and pull out subgroups for easy analysis

Discussion Topic 3

- A diagnostic test exists that identifies a proportion of the population who cannot properly metabolize clopidogrel and instead should be treated with prasugrel. How would you change the model to incorporate this test?

Discussion Topic 3 Solution

- A diagnostic test exists that identifies a proportion of the population who cannot properly metabolize clopidogrel and instead should be treated with prasugrel. How would you change the model to incorporate this test?
  - If a portion of the population cannot properly metabolize clopidogrel, these people should use prasugrel. Add an additional filter to indicate the percentage of the population who should be shunted to prasugrel
  - Population worksheet:
    - Identify people who cannot metabolize clopidogrel (similar to the population with previous stent thrombosis)
  - Treatment Mix worksheet:
    - Add treatment mix row for STEMI/NSTEMI who cannot metabolize clopidogrel (100% of these patients are given prasugrel) or link “with stent thrombosis during clopidogrel treatment” treatment share row

Discussion Topic 3 Solution

- A diagnostic test exists that identifies a proportion of the population who cannot properly metabolize clopidogrel and instead should be treated with prasugrel. How would you change the model to incorporate this test?
  - Costs worksheet:
    - Add cost of test
  - BI Prasugrel worksheet (Calculations):
    - Add cost of test to calculations
    - Who gets cost of test?
      - Everyone in the currently eligible patient subgroups except those with a previous stent thrombosis during clopidogrel treatment
  - Results worksheet:
    - Add cost of test to current costs, could add as a new line item

Discussion Topic 4

- The NICE analysis presented the difference in rehospitalizations between drugs rather than including total rehospitalizations for each drug
  - The modified model includes total rehospitalizations for each drug. How is this addition beneficial?

Discussion Topic 4 Solution

- The NICE analysis presented the difference in rehospitalizations between drugs rather than including total rehospitalizations for each drug
  - The modified model includes total rehospitalizations for each drug. How is this addition beneficial?
    - Knowing total rehospitalization allows the user to be knowledgeable of the 'magnitude of the problem' and to be more granular in his/her examination of resource utilization

Discussion Topic 5

- Suppose other treatments besides prasugrel and clopidogrel are used in practice to treat the disease. How would you include off-label use in the current model?

Discussion Topic 5 Solution

- Suppose other treatments besides prasugrel and clopidogrel are used in practice to treat the disease. How would you include off-label use in the current model?
  - Determine which off-label drug will be included
  - Population worksheet:
    - Are patients (STEMI with thrombosis, other STEMI, NSTEMI with thrombosis, NSTEMI with diabetes) equally eligible for the off-label drug?
      - Edit worksheet to easily enable patient subgroups to receive appropriate treatments
  - Treatment mix worksheet:
    - Allow for uptake of off-label drug in appropriate populations

Discussion Topic 5 Solution

- Suppose other treatments besides prasugrel and clopidogrel are used in practice to treat the disease. How would you include off-label use in the current model?
  - Costs worksheet:
    - Add off-label drug (dosing and costs, if available)
    - Add impact on rehospitalization
  - BI Prasugrel worksheet (calculations):
    - Assign appropriate number of patients according to treatment mix to incur the cost of the drug in population
    - Calculate annual drug costs for off-label drug(s)
    - Calculate number of rehospitalizations that occur among patients on off-label drug
    - Incorporate into total costs

Discussion Topic 5 Solution

- Suppose other treatments besides prasugrel and clopidogrel are used in practice to treat the disease. How would you include off-label use in the current model?
  - Results worksheet:
    - Update drug costs by adding the off-label drug to result
    - Update rehospitalization costs
    - Update rehospitalization outcome

Discussion Topic 6

- What kinds of sensitivity analysis would be interesting and useful to add to the model? How would you include them?

Discussion Topic 6 Solution

- What kinds of sensitivity analysis would be interesting and useful to add to the model? How would you include them?
  - One-way sensitivity analysis:
    - One-way sensitivity analyses helps to present the user with the variability around the point estimate of each parameter.
    - Identify parameters of interest to examine and appropriate ranges around each parameter
      - Ranges taken from literature, expert opinion, ±20% as last resort as long as it is appropriate for the parameter
    - Identify the outcome of interest for which to examine the impact
    - Manually run each parameter at its upper/lower bound and record result in a table
    - Alternatively, automate by setting a worksheet listing each parameter, its base case value and its upper and lower bounds
      - Use visual basic code within Excel to run the model varying each parameter at each of its different values while collecting the results and recording in a table
    - Once table of results is created, one-way tornado plots can be constructed

Discussion Topic 6 Solution

- What kinds of sensitivity analysis would be interesting and useful to add to the model? How would you include them?
  - Scenario analyses:
    - Identify scenarios or alternative values for a set of parameters (e.g., more aggressive vs. less aggressive uptakes of prasugrel) that may make sense for a specific decision-maker
    - Set up these scenarios within the model so that they can be easily populated and run

Interactive Modeling Exercises

Interactive Exercise 1

- Oftentimes, managed care organizations are interested in costs per member per month. Expand the current results to provide per member per month costs

Interactive Exercise 1 Solution

- Oftentimes, managed care organizations are interested in costs per member per month. Expand the current results to provide per member per month costs
  - Add duplicate results table next to current results on Results worksheet. Label first table as total budget impact and second as per-member-per-month (PMPM) budget impact. Calculate PMPM costs as total annual cost divided by the number of people in the plan and by 12 months.

Budget Impact: Tabular Results

Outcome	Current Year	Year 2	Year 3	Year 4	Year 5
Cost Outcomes					
Drug Costs	£0.011	£0.012	£0.012	£0.013	£0.013
Clopidogrel	£0.011	£0.008	£0.007	£0.005	£0.003
Prasugrel	£0.000	£0.004	£0.005	£0.008	£0.010
Rehospitalization Costs	£0.047	£0.047	£0.046	£0.046	£0.046
Total Costs	**£0.057**	**£0.058**	**£0.058**	**£0.059**	**£0.060**
Change in Costs					
Drug Costs		£0.0010	£0.0014	£0.0021	£0.0029
Rehospitalization Costs		-£0.0003	-£0.0004	-£0.0006	-£0.0008
Total Costs		£0.0007	£0.0010	£0.0015	£0.0021

Interactive Exercise 2

See supplementary course materials

- Many US health plans require patients to pay copayments on prescription drugs. Adapt the model to incorporate a copayment of £10 for each prescription

Interactive Exercise 2 Solution

- Many US health plans require patients to pay copayments on prescription drugs. Adapt the model to incorporate a copayment of £10 for each prescription
  - On the Costs worksheet, add a section for copayments. Link to calculations by subtracting copay input in the annual costs column.

Drug Costs

Parameter	Unit Cost	Units per Year	Annual Cost	Sources/Assumptions
Clopidogrel				
People under 75 years				
Loading dose (300 mg)	£5.04	1	£5.04	Price of clopidogrel from British National Formulary 57 (2009). Loading dose for people under 75 years of age is 300 mg (4 tablets of 75 mg each). Regular daily dose is 75 mg regardless of age.
Per prescription (30-tablet pack with daily dose of 75 mg)	£37.83	12	£333.96	
People aged 75 and over				
Per prescription (30-tablet pack with daily dose of 75 mg)	£37.83	12	£333.96	
Prasugrel				
Loading dose (60 mg)	£10.20	1	£10.20	Price of prasugrel from manufacturer's submission (2009). Loading dose is 60 mg (6 tablets of 10 mg each). Regular daily dose is 10 mg; patients 75+ years of age or weighing less than 60 kg receive 5 mg daily. Unit cost represents weighted average.
Per prescription (28-tablet pack with daily dose of 5 or 10 mg)	£47.56	13	£488.28	

Copayments

Parameter	Value	Sources/Assumptions
Patient copayment for each monthly prescription	£10	The model assumes copayments are applied to monthly prescriptions, but not to the loading dose because the loading dose is assumed to be provided in the hospital.

Interactive Exercise 2 Solution

- Many US health plans require patients to pay copayments on prescription drugs. Adapt the model to incorporate a copayment of £10 for each prescription
  - On the BI Prasugrel worksheet, link cell D69 to the copay cell on the Cost worksheet. Red equations are already updated for you.

Copayments

Parameter	Value	Sources/Assumptions
Patient copayment for each monthly prescription	£10	The model assumes copayments are applied to monthly prescriptions, but not to the loading dose because the loading dose is assumed to be provided in the hospital.

	Current Year			Year 2			Year 3			Year 4			Year 5		
Description	Unit cost (£)	Units	Total cost (£)	Unit cost (£)	Units	Total cost (£)	Unit cost (£)	Units	Total cost (£)	Unit cost (£)	Units	Total cost (£)	Unit cost (£)	Units	Total cost (£)
Estimate Drug Costs															
Copay	£10.00														
Clopidogrel															
Patients aged under 75															
Loading dose 300 mg	£5.04	1.00	£5.04	£5.04	1.00	£5.04	£5.04	1.00	£5.04	£5.04	1.00	£5.04	£5.04	1.00	£5.04
75 mg for 12 months (30-tablet pack)	£37.83	12.00	£333.96	£37.83	12.00	£333.96	£37.83	12.00	£333.96	£37.83	12.00	£333.96	£37.83	12.00	£333.96
Cost per patient per year	**£42.87**		**£339.00**	**£42.87**		**£339.00**	**£42.87**		**£339.00**	**£42.87**		**£339.00**	**£42.87**		**£339.00**
Proportion of patients aged 35–74		69%			69%			69%			69%			69%	
Estimated care costs patients aged 35–74		8,727	£2,958,342		6,563	£2,225,000		5,743	£1,946,875		4,102	£1,390,625		2,461	£834,375
Patients aged 75 and over															
75 mg for 12 months (30-tablet pack)	£37.83	12.00	£333.96	£37.83	12.00	£333.96	£37.83	12.00	£333.96	£37.83	12.00	£333.96	£37.83	12.00	£333.96
Cost per patient per year			**£333.96**			**£333.96**			**£333.96**			**£333.96**			**£333.96**
Proportion of patients aged 75 and over		42%			42%			42%			42%			42%	
Estimated care costs – patients aged 75 and over		5,379	£1,796,488		4,046	£1,351,157		3,540	£1,182,262		2,529	£844,473		1,517	£506,684
Total clopidogrel costs		**14,106**	**£4,754,830**		**10,609**	**£3,576,156**		**9,283**	**£3,129,137**		**6,631**	**£2,235,098**		**3,978**	**£1,341,059**
Prasugrel															
Proposed care															
Loading dose 60 mg	£10.20	1.00	£10.20	£10.20	1.00	£10.20	£10.20	1.00	£10.20	£10.20	1.00	£10.20	£10.20	1.00	£10.20
10 mg (5 mg patients weighing under 60 kg or aged 75 and over) for 12 months (28-tablet pack)	£47.56	13.00	£488.28	£47.56	13.00	£488.28	£47.56	13.00	£488.28	£47.56	13.00	£488.28	£47.56	13.00	£488.28
Cost per patient per year	**£57.76**		**£498.48**	**£57.76**		**£498.48**	**£57.76**		**£498.48**	**£57.76**		**£498.48**	**£57.76**		**£498.48**
Proportion of prasugrel patients who receive this dose		100.00%			100.00%			100.00%			100.00%			100.00%	
Total prasugrel costs		**0**	**£0**		**3,147**	**£1,568,749**		**4,341**	**£2,163,707**		**6,728**	**£3,353,623**		**9,115**	**£4,543,540**

Interactive Exercise 3

See supplementary course materials

- Program a dropdown box to allow the user to include or exclude the £10 copayment for each prescription.

Interactive Exercise 3 Solution

- Program a dropdown box to allow the user to include or exclude the £10 copayment for each prescription.
  - Program a dropdown box on the Cost input sheet that sets the copay value to £10 or £0 depending on the user's preference (see next slide for instructions on creating a dropdown box)

Drug Costs

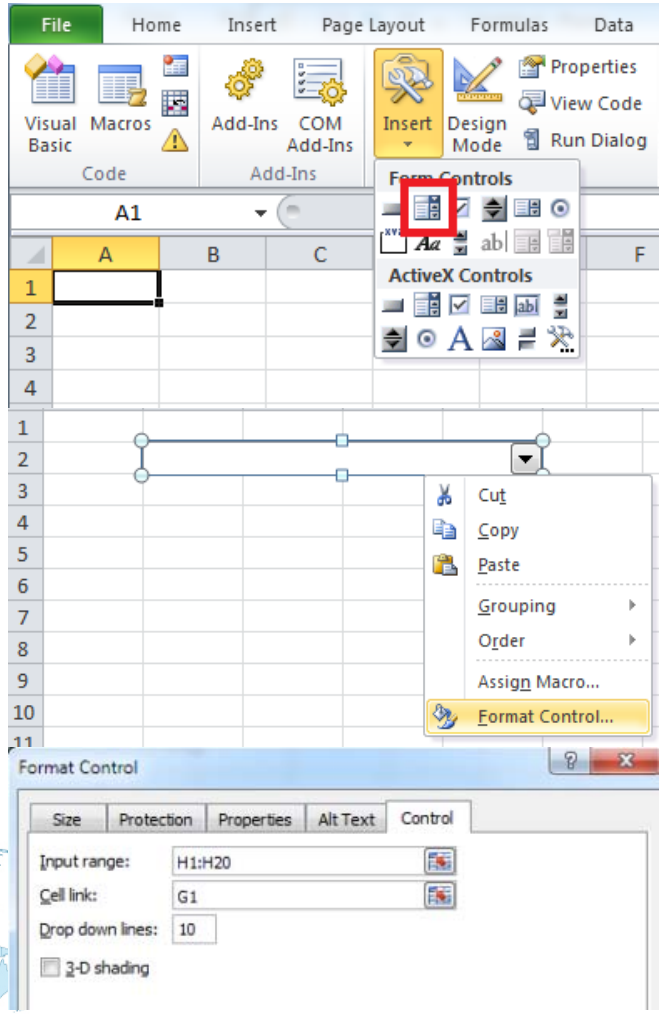
Parameter	Unit Cost	Units per Year	Annual Cost	Sources/Assumptions
Clopidogrel				
People under 75 years				
Loading dose (300 mg)	£5.04	1	£5.04	Price of clopidogrel from British National Formulary 57 (2009). Loading dose for people under 75 years of age is 300 mg (4 tablets of 75 mg each). Regular daily dose is 75 mg regardless of age.
Per prescription (30-tablet pack with daily dose of 75 mg)	£37.83	12	£333.96	
People aged 75 and over				
Per prescription (30-tablet pack with daily dose of 75 mg)	£37.83	12	£333.96	
Prasugrel				
Loading dose (60 mg)	£10.20	1	£10.20	Price of prasugrel from manufacturer's submission (2009). Loading dose is 60 mg (6 tablets of 10 mg each). Regular daily dose is 10 mg; patients 75+ years of age or weighing less than 60 kg receive 5 mg daily. Unit cost represents weighted average.
Per prescription (28-tablet pack with daily dose of 5 or 10 mg)	£47.56	13	£488.28	

Copayments

Parameter	Value	Sources/Assumptions
Patient copayment for each monthly prescription	£10	The model assumes copayments are applied to monthly prescriptions, but not to the loading dose because the loading dose is assumed to be provided in the hospital.
Include patient copayment?	Yes	This dropdown will include or exclude a copayment from the model calculations.
Drop-down box options		
Yes	1	Yes = 1; No = 2
No		
Copayment to use in model	£10	This value updates automatically when the drop-down box selection changes.

Interactive Exercise 3 Solution

- Program a dropdown box to allow the user to include or exclude the £10 copayment for each prescription.
  - Use the following steps to create a dropdown:
    1. Select the Developer tab
    2. In the ‘Controls’ section, select ‘Insert’
    3. Choose the ‘Combo Box’ option
    4. Drag your cursor to create the combo box
    5. Right click on the combo box and select ‘Format Control’
    6. In the ‘Input range’ box, select the cells to specify the list of dropdown options.
    7. In the ‘Cell link’ box, select the cell in which to store the user’s selection (1, 2, 3, …)
    8. Select 3-D shading, if desired



Interactive Exercise 3 Solution

- Program a dropdown box to allow the user to include or exclude the £10 copayment for each prescription.
  - On the BI Prasugrel worksheet, link cell D69 to the new copay cell on the Cost worksheet to reflect the user's preference for including the copay

Drug Costs

Parameter	Unit Cost	Units per Year	Annual Cost	Sources/Assumptions
Clopidogrel				
People under 75 years				
Loading dose (300 mg)	£5.04	1	£5.04	Price of clopidogrel from British National Formulary 57 (2009). Loading dose for people under 75 years of age is 300 mg (4 tablets of 75 mg each). Regular daily dose is 75 mg regardless of age.
Per prescription (30-tablet pack with daily dose of 75 mg)	£37.83	12	£333.96	
People aged 75 and over				
Per prescription (30-tablet pack with daily dose of 75 mg)	£37.83	12	£333.96	
Prasugrel				
Loading dose (60 mg)	£10.20	1	£10.20	Price of prasugrel from manufacturer's submission (2009). Loading dose is 60 mg (6 tablets of 10 mg each). Regular daily dose is 10 mg; patients 75+ years of age or weighing less than 60 kg receive 5 mg daily. Unit cost represents weighted average.
Per prescription (28-tablet pack with daily dose of 5 or 10 mg)	£47.56	13	£488.28	

Copayments

Parameter	Value	Sources/Assumptions
Patient copayment for each monthly prescription	£10	The model assumes copayments are applied to monthly prescriptions, but not to the loading dose because the loading dose is assumed to be provided in the hospital.
Include patient copayment?	Yes	This dropdown will include or exclude a copayment from the model calculations.
Drop-down box options Yes No	1	Yes = 1; No = 2
Copayment to use in model	£10	This value updates automatically when the drop-down box selection changes.

Interactive Exercise 4

- A managed care plan is interested in the impact of adherence on budget impact. Adapt the model to incorporate medication adherence
  - Allow adherence for clopidogrel and prasugrel where adherence between the treatments do not differ
  - Assume that drug costs are directly proportional to adherence (e.g., 90% adherence yields 90% drug costs)
  - Assume each 1% drop in adherence results in a 2% increase in the cost of a rehospitalization (e.g., length of stay in the hospital increases), but does not impact the rate of rehospitalization

Interactive Exercise 4 Solution

- A managed care plan is interested in the impact of adherence on budget impact. Adapt the model to incorporate medication adherence
  - Allow adherence for clopidogrel and prasugrel. Adherence between the treatments do not differ
    - Add a section for incorporating adherence

Adherence

Parameter	Value	Sources/Assumptions
Medication adherence for both prasugrel and clopidogrel	90%	This is the percent of the population that is adherent to their medication.
Percent increase in rehospitalization costs	20%	The model assumes that each 1% reduction in adherence yields a 2% increase in the cost of each rehospitalization.

Interactive Exercise 4 Solution

- A managed care plan is interested in the impact of adherence on budget impact. Adapt the model to incorporate medication adherence
  - Assume that drug costs are directly proportional to adherence (e.g., 90% adherence yields 90% drug costs)
    - The units per year of clopidogrel and prasugrel are multiplied by 90%. Note that the annual cost still correctly accounts for copayments.

Drug Costs

Parameter	Unit Cost	Units per Year	Annual Cost	Sources/Assumptions
Clopidogrel				
People under 75 years				
Loading dose (300 mg)	£5.04	1	£5.04	Price of clopidogrel from British National Formulary 57 (2009). Loading dose for people under 75 years of age is 300 mg (4 tablets of 75 mg each). Regular daily dose is 75 mg regardless of age.
Per prescription (30-tablet pack with daily dose of 75 mg)	£37.83	10.8	£300.56	
People aged 75 and over				
Per prescription (30-tablet pack with daily dose of 75 mg)	£37.83	10.8	£300.56	
Prasugrel				
Loading dose (60 mg)	£10.20	1	£10.20	Price of prasugrel from manufacturer's submission (2009). Loading dose is 60 mg (6 tablets of 10 mg each). Regular daily dose is 10 mg; patients 75+ years of age or weighing less than 60 kg receive 5 mg daily. Unit cost represents weighted average.
Per prescription (28-tablet pack with daily dose of 5 or 10 mg)	£47.56	11.7	£439.45	

Interactive Exercise 4 Solution

- A managed care plan is interested in the impact of adherence on budget impact. Adapt the model to incorporate medication adherence
  - Assume each 1% drop in adherence results in a 2% increase in the cost of rehospitalizations (i.e., length of stay in hospital increases), but does not impact the rate of rehospitalization
    - Assuming adherence is 90%, rehospitalization costs are increased by 20%

Disease-Related Event/Costs

Parameter	Rate	Sources/Assumptions
Rehospitalization expected when on clopidogrel	37.7%	Mahoney et al., 2010.
Expected reduction in hospitalization when on prasugrel	0.0087	Daiichi-Sankyo (2009) Eli Lilly and Company Ltd STA submission: Prasugrel for the treatment of acute coronary artery syndromes with coronary intervention. (Table 34 adjusted to reflect UK rehospitalisation rates in Table 36).
	Cost	
Cost of rehospitalization	£6,414	Rehospitalization categories mapped to NHS mandatory tariff 2009/10 and reference costs 2007–08 (where no mandatory tariff). HRG codes used are: AA21Z; AA09Z; AA15Z; EB10Z; EA31Z to EA34Z; EA14Z to EA16Z; EA40Z to EA42Z. Reference cost code used FZ38A.

Interactive Exercise 5

- The Population worksheet does not distinguish between estimated annual incidence of ACS and actual annual diagnoses
  - What is the distinction between estimated annual incidence and actual annual diagnoses?
  - What are the implications of assuming they are equivalent?
  - Assuming the Population worksheet provides estimated annual incidence, add diagnosis to the calculation. The probability of being diagnosed given that patients have ACS is 90%

Interactive Exercise 5 Solution

- The Population worksheet does not distinguish between estimated annual incidence of ACS and actual annual diagnoses
  - What is the distinction between estimated annual incidence and actual annual diagnoses?
    - The annual incidence captures all new cases of the disease. The annual diagnoses are those who are new cases and seek a diagnosis

Interactive Exercise 5 Solution

- The Population worksheet does not distinguish between estimated annual incidence of ACS and actual annual diagnoses
  - What are the implications of assuming they are equivalent?
    - Since we are assuming all incident cases are diagnosed in the model, we are potentially overestimating costs

Interactive Exercise 5 Solution

- The Population worksheet does not distinguish between estimated annual incidence of ACS and actual annual diagnoses
  - Assuming the Population worksheet provides estimated annual incidence, add diagnosis to the calculation. The probability of being diagnosed given that patients have ACS is 90%.

Patients Living with Disease/Condition

Parameter	Age Groups			Source/Assumption
	<35	35-75	75+	
Population of England by age group	22,263,025	24,365,697	3,913,783	Office for National Statistics population estimates by primary care organisation 2006.
Total population in England		50,542,505		
Estimated annual incidence of acute coronary syndrome (ACS), by age group	0.0%	0.6%	2.3%	<35: Model assumed incidence to be negligible. 35-75: Incidence calculated from Taylor et al., 2007. 75+: Incidence calculated based on HES 2007-08 data (codes I20.0 to I22.9).
Number of incident cases	0	144,525	89,089	Main et al. (2004)
Number of people diagnosed with ACS each year, by age group	0	130,073	80,180	Population by age group, multiplied by annual incidence.
Total number of people diagnosed with ACS each year		210,253		

Diagnosis

Parameter	Rate	Source/Assumption
Percentage of incident cases that are diagnosed	90.0%	The percentage of incident population that receive a diagnosis.

Interactive Exercise 6

- In the third year of forecasting, clopidogrel loses its patent protection, and generics are able to join the market. How would you change the model to reflect this change?

Interactive Exercise 6 Solution

- In the third year of forecasting, clopidogrel loses its patent protection, and generics are able to join the market. How would you change the model to reflect this change?
  - On the Costs worksheet, insert a new section for generic costing of clopidogrel

Generic Price of Clopidogrel

Parameter	Value	Sources/Assumptions
Generic drug cost (as a percentage of brand cost)	50%	Clopidogrel is expected to become generic in Year 3 of the model; therefore, the model applies generic costing from Year 3 onward for clopidogrel.
Generic cost of clopidogrel		
Loading dose (300 mg)	£2.52	Calculation of the generic cost for the clopidogrel loading dose.
Per prescription (30-tablet pack with daily dose of 75 mg)	£18.92	Calculation of the generic cost for a monthly clopidogrel prescription.

Interactive Exercise 6 Solution

- In the third year of forecasting, clopidogrel loses its patent protection, and generics are able to join the market. How would you change the model to reflect this change?
  - On the BI Prasugrel worksheet, link the new generic costs into the calculations. Specifically, link the generic costs of clopidogrel for year 3 to cells J72 and J73, year 4 to cells M72 and M73, and year 5 to cells P72 and P73

	Current Year			Year 2			Year 3			Year 4			Year 5		
Description	**Unit cost (£)**	**Units**	**Total cost (£)**	**Unit cost (£)**	**Units**	**Total cost (£)**	**Unit cost (£)**	**Units**	**Total cost (£)**	**Unit cost (£)**	**Units**	**Total cost (£)**	**Unit cost (£)**	**Units**	**Total cost (£)**
Estimate Drug Costs															
Copay	**£10.00**														
Clopidogrel															
Patients aged under 75															
Loading dose 300 mg	£5.04	1.00	£5.04	£5.04	1.00	£5.04	**£2.52**	1.00	£2.52	**£2.52**	1.00	£2.52	**£2.52**	1.00	£2.52
75 mg for 12 months (30-tablet pack)	£37.83	10.80	£300.56	£37.83	10.80	£300.56	**£18.92**	10.80	£96.28	**£18.92**	10.80	£96.28	**£18.92**	10.80	£96.28
Cost per patient per year	**£42.87**		**£305.60**	**£42.87**		**£305.60**	**£21.44**		**£98.80**	**£21.44**		**£98.80**	**£21.44**		**£98.80**
Proportion of patients aged 35–74		69%			69%			69%			69%			69%	
Estimated care costs patients aged 35–74		8,727	£2,666,906		6,563	£2,005,808		5,743	£567,419		4,102	£405,299		2,461	£243,180
Patients aged 75 and over															
75 mg for 12 months (30-tablet pack)	£37.83	10.80	£300.56	£37.83	10.80	£300.56	£18.92	10.80	£96.28	£18.92	10.80	£96.28	£18.92	10.80	£96.28
Cost per patient per year			**£300.56**			**£300.56**			**£96.28**			**£96.28**			**£96.28**
Proportion of patients aged 75 and over		42%			42%			42%			42%			42%	
Estimated care costs – patients aged 75 and over		5,379	£1,616,839		4,046	£1,216,041		3,540	£340,851		2,529	£243,465		1,517	£146,079
Total clopidogrel costs		**14,106**	**£4,283,746**		**10,609**	**£3,221,849**		**9,283**	**£908,270**		**6,631**	**£648,764**		**3,978**	**£389,259**

Interactive Exercise 6 Solution

- In the third year of forecasting, clopidogrel loses its patent protection, and generics are able to join the market. How would you change the model to reflect this change?
  - Consider updating the treatment mix
    - Utilization of clopidogrel may change due to lower generic cost
    - The branded version is likely to retain some utilization. So, consider tracking utilization of the branded and generic versions separately for year 3 and beyond
  - Consider the impact on copayments, which would likely need to be reprogrammed to account for different copayment tiers for brand and generic drugs

Original Interactive Exercise 2

- Program a dropdown box to allow the user to show either total or per member per month cost results

Original Interactive Exercise 2 Solution

- Program a dropdown box to allow the user to show either total or per member per month cost results
  - With the new results just created, program a dropdown box on the main results table that pulls the correct corresponding results when a user chooses between PMPM and total annual costs

Budget Impact: Tabular Results Total Costs

Outcome	Current Year	Year 2	Year 3	Year 4	Year 5
Cost Outcomes					
Drug Costs	£6,447,553	£7,046,901	£7,274,208	£7,728,821	£8,183,434
Clopidogrel	£6,447,553	£4,849,271	£4,243,112	£3,030,794	£1,818,477
Prasugrel	£0	£2,197,631	£3,031,096	£4,698,027	£6,364,958
Rehospitalization Costs	£28,424,710	£28,264,360	£28,200,220	£28,077,285	£27,954,350
Total Costs	**£34,872,263**	**£35,311,261**	**£35,474,428**	**£35,806,106**	**£36,137,784**
Change in Costs					
Drug Costs		£599,348	£826,655	£1,281,268	£1,735,881
Rehospitalization Costs		-£160,350	-£224,490	-£347,425	-£470,360
Total Costs		£438,998	£602,165	£933,843	£1,265,521
Health Outcomes					
Number of Rehospitalizations	5,318	5,288	5,276	5,253	5,230
Rehospitalizations Avoided		30	42	65	88

Best Practices for Budget Impact Modeling

Best Practices for BIA Computer Program

- Develop the BIA in a common software package that decision-makers can easily use (e.g., a basic spreadsheet package)
- Design the BIA in the software package to be flexible so that different decision-makers can easily adapt/use for their situation
- Develop the BIA so that it is interactive
- Provide an introduction worksheet to describe the structure, assumptions, and set up of the program
- Include navigation buttons to lead the decision-maker through the BIA
- Use cell highlighting to indicate the cells for user inputs and the cells that represent a model formula

Best Practices for BIA Computer Program

- Setup of inputs
  - Present inputs so that they are easy to access/change
  - Limit the number of inputs the decision-maker must enter
  - Provide a short list of suggested variables that the decision-maker may want to change
  - Provide default values for all inputs in the BIA
    - One set of default values for all decision-makers may not be feasible. Consider different perspectives (e.g., VA, Medicare, Medicaid, Blue Cross, etc). Allow for easy toggle between each.
    - Present sources, assumptions, and/or any computations to derive default inputs clearly and completely
    - Program the BIA so that default values can be restored easily

Best Practices for BIA Computer Program

- Setup of outputs
  - Present outputs in logical manner
  - Present outputs in both tabular and graphical format
  - When presenting outputs graphically, set appropriate axis limits
  - Provide for scenario/sensitivity analysis
- Present calculations clearly and allow them to be accessible to the decision-maker
- Include a complete reference list
- Provide a user guide

Wrap Up

Summary

In this course, we have

- Interpreted an Excel-based budget impact analysis
- Modified an existing budget impact analysis based on new evidence or needs
- Learned good practices for developing budget impact analyses

Wrap Up

- This course was developed based on requests and feedback from the Introduction to Budget Impact Analysis: A 6-Step Approach short course
- Help us make this course of value for you! Tell us what was useful, not so useful, and topics that you wished were covered but were not
- Certificates of completion are outside the room
- Please complete your evaluation forms

Thank you!!!!