

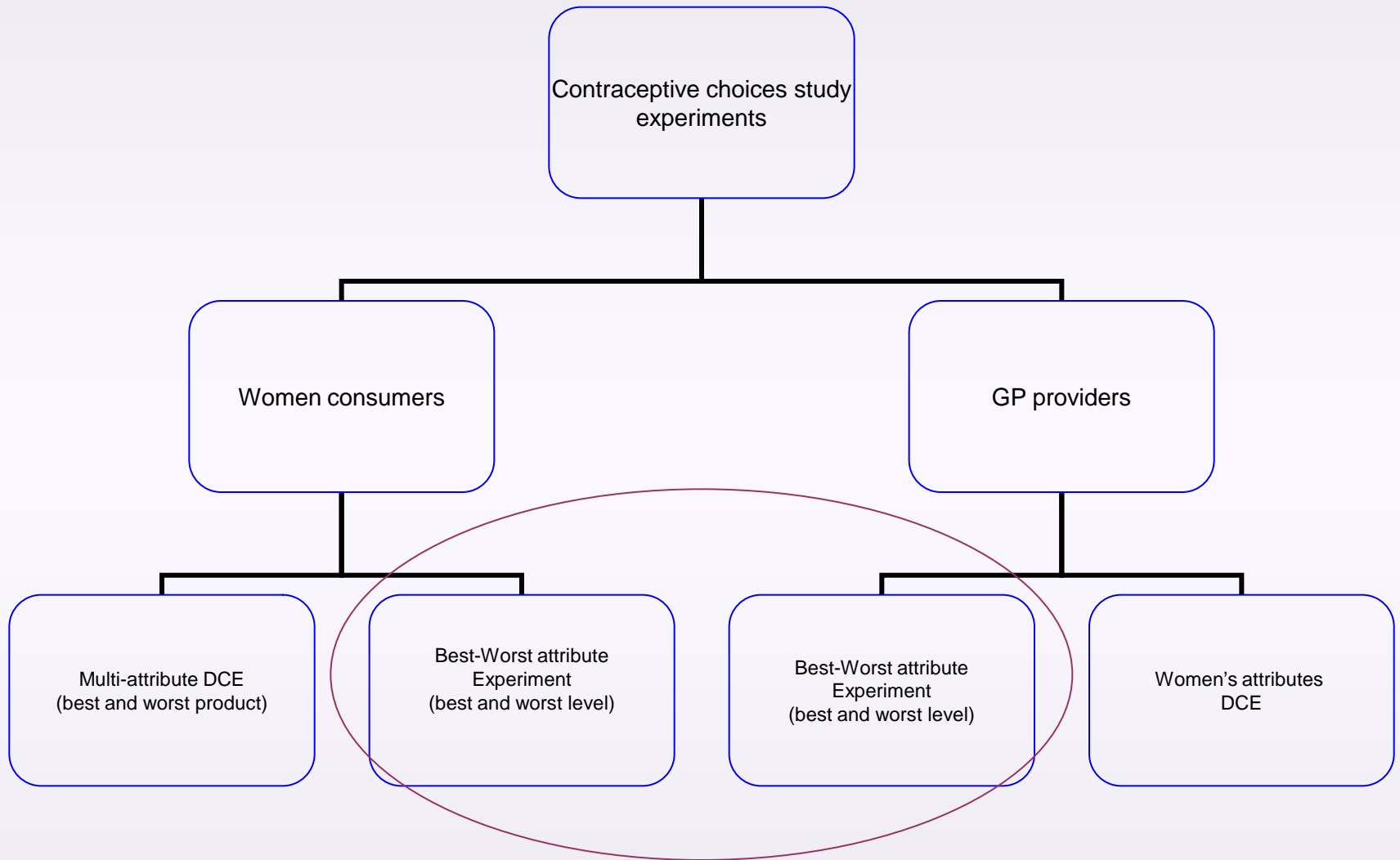
What's good and bad about contraception? Application of a Best-Worst Attribute experiment

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Introduction

- Application of a Best-Worst Attribute Scaling Task
 - Stated preference method
 - Variant from standard discrete choice experiment
- Contraceptive Choices Study
 - Women's preferences for prescribed contraceptive methods
 - GPs advice to women on prescribed contraceptive methods
 - ARC linkage grant



Background

- Reproductive health important contributor to healthy and productive lives
- Around 56% of Australian women aged 18-49 use contraception (NHS 2001)
 - contraceptive pill the most widely used
- New methods entering the Australian market in last decade
 - greater convenience, flexibility, less prone to “user error”, non-invasiveness
 - Greater choice → increased complexity of choices
 - unknown side effects or complexity of administration
- Little data about how decisions are made

Contraceptive pill most commonly used, but other methods increasing in use..

Percent of women reporting use of contraception or sterilisation: by age group

Age in years	18-24	25-29	30-34	35-39	40-44	45-49	18-49
Contraceptive use	77.6%	69.5%	59.3%	51.3%	46.3%	37.3%	56.4%
Hysterectomy/tubal ligation	1.3%	3.5%	7.0%	14.8%	16.3%	14.2%	9.9%
Partner vasectomy	0.4%	0.9%	4.9%	8.5%	11.3%	14.4%	6.9%

Type of contraceptive method for women using a contraceptive method: by age group

Age in years	18-24	25-29	30-34	35-39	40-44	45-49	18-49
Condoms	46.8%	39.3%	38.0%	35.9%	37.4%	42.2%	40.1%
Pills	69.9%	64.7%	58.8%	53.2%	50.0%	41.3%	59.9%
IUD	0.6%	1.0%	2.6%	4.9%	4.7%	6.4%	2.6%
DepoProvera	4.7%	4.8%	5.8%	4.1%	5.4%	1.8%	4.8%
Combined pill and condom	22.9%	12.1%	6.9%	3.1%	2.5%	0.9%	10.3%

Source: National Health Survey 2001

Stated preference methods in health services research

- Revealed preferences from observed behaviour
 - not always available in health services
 - limited treatment options in reality
 - Cannot express preferences
- Stated preference methods
 - hypothetical
 - can vary attribute levels systematically through design
 - DCEs
 - choose BETWEEN complete product/treatment profiles
 - Best Worst Attribute Scaling Task
 - choose the best and worst feature WITHIN a product profile

Best Worst Attribute Scaling Task

- Respondent shown single profile of product or service that is described by attribute levels
- Asked to choose the best feature (attribute level) and worst feature of the profile
- Series of profiles
- Attribute levels varied across profiles by design of experiment
- Respondent directly values the levels of different attributes within a profile relative to each other
- Respondent is choosing pair of levels with the greatest distance in latent utility.

Best-Worst Attribute Scaling

- Theory & method
 - Flynn, Louviere, Peters & Coast 2007
 - Lancsar, Louviere & Flynn 2007
 - Marley & Louviere 2005
- Application in Health Services Research
 - Preferences for dermatology consultations
 - Coast, Salisbury et al (2006)
 - Quality of Life
 - Coast, Flynn et al (2008)
- Best Worst Attribute task can compare attributes against each other
 - All attribute levels are valued relative to each other, eg: attractiveness of 3-monthly administration is directly compared with the attractiveness of the cost of \$7 per month
 - Therefore can rank levels across all attributes on the same scale
- Less cognitively demanding task
 - Best Worst Attribute task respondent directly compares levels across attributes.
 - All attribute levels are valued with each other, eg: attractiveness of 3-monthly administration is directly compared with the attractiveness of the cost of \$7 per month
 - Therefore can rank levels across all attributes on the same scale
 - Less cognitively demanding task

Rationale for Best-Worst Attribute Scaling Task in contraceptives study

- More acceptable task for GPs
 - hypothetical choice scenarios in standard DCE present multiple choices among options with varying degrees of plausibility.
 - Best-Worst Attribute task respondent only values attribute levels within profile, avoids judgement of whole profile.
 - Context less important in Best-Worst
- Repeat experiment in sample of Women consumers
 - direct comparison with GPs results

Attributes

- Selection
 - literature review
 - clinical experts in family planning
 - focus groups (women and GPs)
- 7 attributes
 - product (8 levels)
 - effect on acne (3 levels)
 - effect on weight (4 levels)
 - frequency of administration (3 levels)
 - contraceptive effectiveness (3 levels)
 - effect on bleeding (8 levels)
 - cost (4 levels)
 - levels of frequency and effectiveness nested in product

What are the alternative products?

- Prescribed vs non-prescribed
- 'Prescribed' products currently available in Australia
 - contraceptive pill (combination progestogen and oestrogen)
 - progestogen only pill (minipill)
 - hormonal implant (eg Implanon)
 - intra-uterine hormonal device (eg Mirena)
 - Depo Provera Injection
 - IUD
 - hormonal vaginal ring
- Potential new product
 - hormonal skin patch

10th Contraceptive product

Below is a hypothetical contraceptive product which has the features described. Please read the description of the product and choose which in your opinion is the best feature of this method and which is the worst.

Attributes	Product description	Which is the best feature of this method?	Which is the worst feature of this method?
Type of product	Intra-uterine hormonal device	<input type="checkbox"/>	<input type="checkbox"/>
Effect on Acne	This product has no effect on acne symptoms	<input type="checkbox"/>	<input type="checkbox"/>
Effect on Weight	Some women using this product may lose up to 1 kg in weight	<input type="checkbox"/>	<input type="checkbox"/>
Frequency of Administration	Once a year	<input type="checkbox"/>	<input type="checkbox"/>
Contraceptive effectiveness	1 in 1000 women using this product get pregnant in a 12 mth period	<input type="checkbox"/>	<input type="checkbox"/>
Cost	\$7 per month	<input type="checkbox"/>	<input type="checkbox"/>
Effect on Periods	Most women using this method experience irregular bleeding	<input type="checkbox"/>	<input type="checkbox"/>

Would you consider using this contraceptive product with the features described above?

Very unlikely

Somewhat likely

Very likely

Design of experiment

- Design principles for usual DCEs well understood
 - Street & Burgess 2007
- Design selection for Best-Worst Attribute experiments?
 - Complexities due to nested attributes
 - Interested in product specific results
- Constructed design based on principles for standard DCEs
- Tested design by Monte Carlo simulations
 - Ensure design is adequate to return consistent estimates

Constructing design

- Starting design
 - fractional factorial for 6 attributes (excluding product)
 - $4^5 \times 8$ in 32 runs OMEP starting design
 - collapsed to $4^2 \times 3^3 \times 8$ in 32 runs
- Repeated the design for each product
 - allowed for product specific analysis
 - = 256 product profiles
- 16 versions of 16 choice sets each
 - a respondent saw each product exactly twice, and
 - each version had half of the original 32 run OMEP.

Choice set of Best-Worst pairs in each profile

- K attributes- each profile is described by K levels.
 - each level in the profile can be paired with each other attribute twice (once as best and once as worst).
 - = $K(K-1)$ best-worst pairs in each scenario.
 - 7 attributes so each scenario had $7 \times 6 = 42$ best-worst pairs.
 - 42 pairs is the implied choice set
- The total possible number of distinct pairs for all attribute levels can be calculated as follows:
 - let $A =$ total number of attribute levels = $\sum_{i=1}^K L_i$
 - then total number of best worst pairs = $\sum_{i=1}^K L_i [A - L_i]$
 - = 902 best-worst pairs

Analysis of Best-Worst Attribute task

- profiles are expanded into all possible best-worst pairs of levels (choice set = 42 pairs)
- decision flag (1) assigned to the pair chosen as best and worst (0 otherwise)
- chosen pair as the outcome
- analyse using multinomial (conditional) logit
 - MNL model assumes best and worst levels are chosen simultaneously
 - Models pair of attribute levels furthest apart on the utility scale
 - Marley & Louviere 2005, Flynn et al 2007

Best-Worst pair parameters: levels only model

- Analysed the best-worst pairs fitting attribute levels only
- One level of a single attribute is omitted as base

$$\text{Number of parameters} = \left[\sum_{i=1}^K L_i \right] - 1$$

(Rather than the usual $\sum_{i=1}^K [L_i - 1]$)

- Rank the levels of all attributes by size and direction of MNL coefficients

Monte Carlo simulations on design

- to test design can return estimates that agree with prior assigned values
 - 100 simulated samples
 - expand scenarios from design into all best-worst pairs
 - prior values assigned to each level of each attribute
 - iid extreme value error terms added to each best-worst pair to create total utility difference for each pair
 - “choice” is pair with greatest difference in utility
 - analysis of chosen pair with MNL
 - mean estimate coefficients from analyses compared with priors

Results of Monte Carlo simulations on design: mean betas from 100 independent samples

Variable	prior beta	Mean betas	Std Dev
prod1	1.00	1.00	0.15
prod2	2.50	2.54	0.16
prod3	1.50	1.51	0.15
prod4	1.80	1.78	0.19
prod5	2.20	2.21	0.16
prod6	2.00	1.99	0.15
prod7	2.50	2.51	0.16
prod8	2.00	2.04	0.18
cost1	3.00	3.01	0.14
cost2	2.50	2.51	0.15
cost3	0.80	0.80	0.13
cost4	0.50	0.50	0.13
weight1	0.80	0.80	0.13
weight2	1.25	1.25	0.14
weight3	0.50	0.50	0.14
weight4	1.00	1.02	0.12

Variable	prior beta	Mean betas	Std Dev
freq1	4.00	4.01	0.13
freq2	1.00	0.99	0.14
freq3	0.30	0.32	0.12
effect1	2.00	2.01	0.13
effect2	0.80	0.81	0.13
effect3	0.40	0.40	0.13
bleed1	0.20	0.21	0.15
bleed2	3.20	3.19	0.17
bleed3	1.50	1.50	0.15
bleed4	1.00	0.99	0.18
bleed5	0.30	0.31	0.15
bleed6	0.20	0.20	0.16
bleed7	0.10	0.10	0.15
acne1	0.50	0.50	0.12
acne2	1.50	1.50	0.15
acne3	1.00	1.00	0.15

Results of contraceptives Best-Worst attribute experiment

- Women sample (n = 200)
 - on-line panel
 - women aged 18-50 years
 - currently using contraception or expecting to within the next 5 years
- GP sample (n = 162)
 - drawn from randomised list of > 14,000 GPs
 - invited by telephone and fax to participate
 - remuneration for time

Women's sample demographics (n = 200)

Mean age	36 years
Median household income	\$52,000 - \$67,599 pa
Full-time employment	27.0%
Not employed	40.5%
Married/defacto	66.0%
Dependent children	57.0%
Currently using contraception	71.5%
Currently using oral pill	43.5%

GP sample (n = 162) compared with all Australian GPs

		sample	Australian GPs*
GP Sex	Female	64.2%	35.9%
Median age	Years	48	45-54
State	NSW	34.0%	33.8%
	ACT	1.9%	1.6%
	VIC	21.6%	25.0%
	QLD	24.7%	18.8%
	WA	8.0%	9.1%
	SA	7.4%	8.4%
	TAS	0.6%	2.7%
	NT	1.9%	0.7%
Place of graduation	Australia	76.5%	69.8%

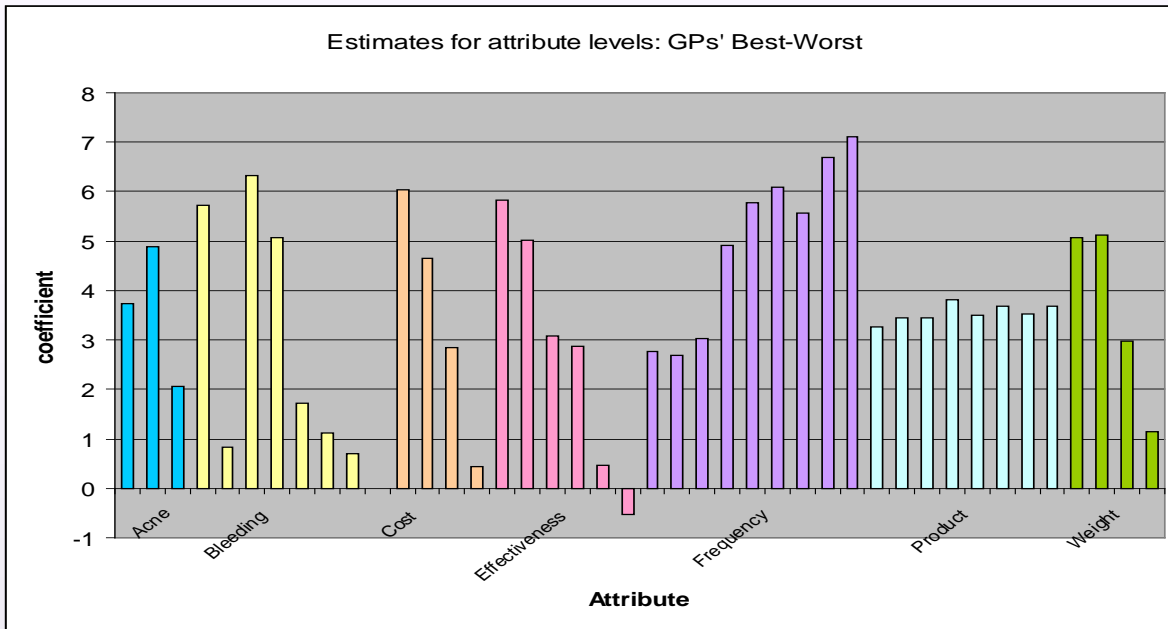
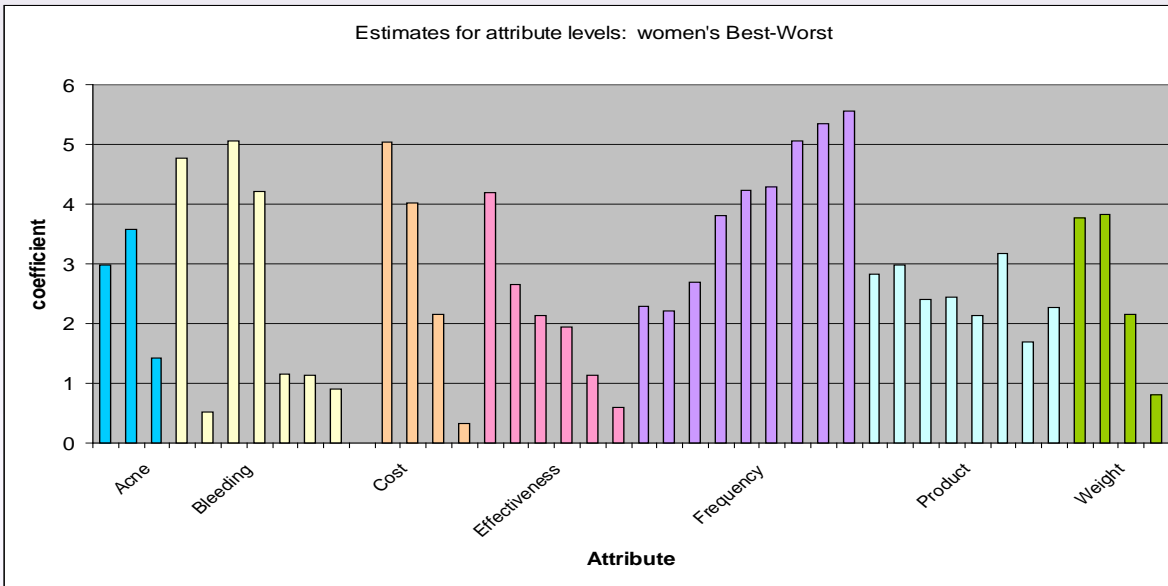
*All GPs who claimed at least 375 A1 Medicare items during the most recent 3-month Medicare Australia data period. Australian Government Department of Health and Ageing (BEACH 2007-2008)

Ranking levels best to worst: women's sample

Rank	Level	Level description
1	freq9	Once every 5 years
2	freq8	Once every 3 years
3	bleed3	Most women experience light periods with less pain
4	freq7	Once a year
5	cost1	\$1 per month
6	bleed1	Most women experience no periods
7	freq6	Once every 6 months
8	freq5	Once every 3 months
9	bleed4	Most women experience light periods with no change in pain
10	effect1	1 in 1000 women get pregnant in a 12 mth period
11	cost2	\$7 per month
12	Weight2	Some women may lose up to 1 kg in weight
13	freq4	Once a month
14	Weight1	This method has no effect on weight
15	acne2	Improves acne symptoms
16	prod6	Patch
17	prod2	Mini Pill
18	acne1	Has no effect on acne symptoms
19	prod1	Combined Pill
20	freq1	1 per day
21	effect2	1 in 500 women get pregnant in a 12 mth period
22	prod4	Implant
23	prod3	Injection
24	freq2	1 per day within interval
25	prod8	IUD
26	freq3	1 per day at the same time
27	cost3	\$20 per month
28	Weight3	Some women may gain up to 1 kg in weight
29	prod5	Intra-uterine Hormonal Device
30	effect3	1 in 100 women get pregnant in a 12 mth period
31	effect4	1 in 100 women get pregnant in a 12 mth period
32	prod7	Vaginal Ring
33	acne3	In some women worsens acne symptoms
34	bleed5	Most women experience light periods with increased pain
35	effect5	5 in 100 women get pregnant in a 12 mth period
36	bleed6	Most women experience heavy periods with less pain
37	bleed7	Most women experience heavy periods with no change in pain
38	Weight4	Some women may gain up to 3 kg in weight
39	effect6	10 in 100 women get pregnant in a 12 mth period
40	bleed2	Most women experience irregular bleeding
41	cost4	\$60 per month
42	bleed8	Most women experience heavy periods with increased pain

Ranking levels best to worst: GP sample

Rank	Level	Level description
1	freq9	Once every 5 years
2	freq8	Once every 3 years
3	bleed3	Most women experience light periods with less pain
4	freq6	Once every 6 months
5	cost1	\$1 per month
6	effect1	1 in 1000 women get pregnant in a 12 mth period
7	freq5	Once every 3 months
8	bleed1	Most women experience no periods
9	freq7	Once a year
10	weight2	Some women may lose up to 1 kg in weight
11	weight1	This method has no effect on weight
12	bleed4	Most women experience light periods with no change in pain
13	effect2	1 in 500 women get pregnant in a 12 mth period
14	freq4	Once a month
15	acne2	Improves acne symptoms
16	cost2	\$7 per month
17	prod4	Implant
18	acne1	has no effect on acne symptoms
19	prod6	Patch
20	prod8	IUD
21	prod7	Vaginal Ring
22	prod5	Intra-uterine Hormonal Device
23	prod3	Injection
24	prod2	Mini Pill
25	prod1	Combined Pill
26	effect3	1 in 100 women get pregnant in a 12 mth period
27	freq1	1 per day
28	weight3	Some women may gain up to 1 kg in weight
29	effect4	1 in 100 women get pregnant in a 12 mth period
30	cost3	\$20 per month
31	freq2	1 per day within interval
32	freq3	1 per day at the same time
33	acne3	Worsens acne symptoms
34	bleed5	Most women experience light periods with increased pain
35	weight4	Some women may gain up to 3 kg in weight
36	bleed6	Most women experience heavy periods with less pain
37	bleed2	Most women experience irregular bleeding
38	bleed7	Most women experience heavy periods with no change in pain
39	effect5	5 in 100 women get pregnant in a 12 mth period
40	cost4	\$60 per month
41	bleed8	Most women experience heavy periods with increased pain
42	effect6	10 in 100 women get pregnant in a 12 mth period



Modelling unconditional demand

- Unconditional demand model
 - “would you recommend/consider using the product described above”
 - Outcome
 - Very unlikely, somewhat likely, very likely
 - Model with ordinal logistic regression
 - Positive estimates - increases likelihood of using or recommending a product with this attribute level
 - Negative estimates-less likely to use or recommend a product with this attribute level

Overall acceptability of profiles

	Women	GPs
	Would you consider using this contraceptive product with the features described? %	Would you recommend a product with these features to a woman seeking contraceptive advice? %
Very unlikely	56.8	32.4
Somewhat likely	34.6	47.9
Very likely	8.6	19.8

Ordinal logit women's sample

"Would you consider using the product as described?"

Outcome: "very unlikely", "somewhat likely", "very likely"

Level	label	estimate	
Product base=combined pill	minipill	-0.37 **	* p<.05 ** p<.01
	injection	-0.67 **	
	implant	-0.59 **	
	hormonal IUD	-0.88 **	
	skin patch	-0.75 **	
	vaginal ring	-1.54 **	
	IUD	-0.98 **	
Effectiveness (annual preg rate) base= 1/100	1/1000	0.11	
	1/500	0.00	
	5/100	-0.36 **	
	10/100	-0.26 *	
Frequency base = same time daily base = once 1 mth base = once 1 yr	1 per day	0.03	
	1 per day interval	-0.14	
	once 3 mth	-0.03	
	once 6 mth	0.23	
	once 3 yr	0.02	
	once 5 yr	0.24	
Cost base = \$1	\$7	-0.08	
	\$20	-0.42 **	
	\$60	-0.89 **	
Acne base = no effect	improves acne	0.00	
	worsens acne	-0.25 **	
Weight base = no effect	lose 1k	-0.04	
	gain 1 k	-0.28 **	
	gain 3 k	-0.56 **	
Bleeding base = no periods	Irregular	-0.56 **	
	light/less pain	0.14	
	light/same pain	0.07	
	light/increased pain	-0.42 **	
	heavy/lesss pain	-0.47 **	
	Heavy/same pain	-0.44 **	
	Heavy/increased pain	-0.95 **	

Ordinal logit

GPs' sample

"Would you consider recommending the product as described?"

Outcome: "very unlikely", "somewhat likely", "very likely"

Level	label	estimate	
Product base=combined pill	minipill	-0.36 *	* p<.05 ** p<.01
	injection	-0.92 **	
	implant	-0.49 *	
	hormonal IUD	-0.64 **	
	skin patch	-0.80 **	
	vaginal ring	-0.46 *	
	IUD	-0.98 **	
Effectiveness (annual preg rate) base= 1/100	1/1000	0.45 **	
	1/500	0.45 **	
	5/100	-1.05 **	
	10/100	-1.85 **	
Frequency base = same time daily base = once 1 mth base = once 1 yr	1 per day	0.00	
	1 per day interval	0.04	
	once 3 mth	0.12	
	once 6 mth	0.21	
	once 3 yr	0.23	
	once 5 yr	0.54 **	
Cost base = \$1	\$7	-0.20	
	\$20	-0.51 **	
	\$60	-1.33 **	
Acne base = no effect	improves acne	-0.17	
	worsens acne	-0.40 **	
Weight base = no effect	lose 1k	-0.02	
	gain 1 k	-0.27	
	gain 3 k	-0.50 **	
Bleeding base = no periods	Irregular	-0.67 **	
	light/less pain	-0.08	
	light/same pain	-0.14	
	light/increased pain	-0.92 **	
	heavy/less pain	-0.91 **	
	Heavy/same pain	-1.19 **	
	Heavy/increased pain	-1.77 **	

Discussion

- Monte Carlo simulations provided a practical approach to selecting a design for Best-Worst attribute experiment
- Women consumers and GPs had similar values for most attribute levels
 - Long administration times very attractive to both groups
 - GPs somewhat greater emphasis on effectiveness
 - women somewhat greater emphasis on bleeding
 - women did not like the vaginal ring
- Ordinal logit
 - Did not reveal the attractiveness of longer administration relative to other attribute levels

Acknowledgements

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- Family Planning NSW
- Organon
- Janssen-Cilag
- Schering (now Bayer)

Women participants

GP participants