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# Information Delivery, User Decision Approach, and Choice Environment: Examining the Effectiveness of Non-Compensatory and Customization-based Online Decision Support.

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# INFORMATION DELIVERY, USER DECISION APPROACH, AND CHOICE ENVIRONMENT: EXAMINING THE EFFECTIVENESS OF NON-COMPENSATORY AND CUSTOMIZATION-BASED ONLINE DECISION SUPPORT

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To: Dean Joanne Li
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This dissertation, written by Malgorzata Kolotylo-Kulkarni, and entitled Information Delivery, User Decision Approach, and Choice Environment: Examining the Effectiveness of Non-compensatory and Customization-based Online Decision Support, having been approved in respect to style and intellectual content, is referred to you for judgment.

We have read this dissertation and recommend that it be approved.

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ABSTRACT OF THE DISSERTATION

INFORMATION DELIVERY, USER DECISION APPROACH,

AND CHOICE ENVIRONMENT: EXAMINING THE EFFECTIVENESS OF

NON-COMPENSATORY AND CUSTOMIZATION-BASED ONLINE DECISION

SUPPORT

by

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Decision support research has largely focused on the mechanics of tool design, with less attention paid to the way the alternatives are presented to the user - that is, the format of the output, how the decision tool design can play a role in it, and the output content (characteristics). Furthermore, little research has examined specific decision contexts and user's cognitive aspects pertinent to the choice task, and their role during an online purchase. This study addresses these issues by investigating the impact of output format and content of a non-compensatory (NC) tool and a customization-based tool on user's decision quality in the context of a health insurance purchase. It also examines the moderating role of context (perceived risk) and user's decision approach (price heuristics) – both salient in a health plan choice.

Drawing from risk perception, decoy effect, price order effect, and options framing, this research carries out 2 studies: 2x3x2 full factorial between subjects experiments. Study 1 examines the effect of NC Descending (price High-Low) choice sets with asymmetrically dominated alternatives, while Study 2 examines NC Descending, NC Ascending, and customization-based tools. Both studies

also investigate the roles of perceived risk (high vs low), and user's decision approach (price heuristics-driven strong vs weak).

Results of Study 1 demonstrate that output content characterized by price anchoring differentially affects user's decision quality; and Study 2 indicate that by subjecting the user to reference dependence, usage of NC Descending tool can have a negative impact on decision quality (highest price paid), and usage of NC Ascending and Financial tool have a positive impact (lower price paid). These dynamics change for users under different levels of perceived risk and with disparate decision approaches. Usage of a customization-based tool, as per the design delineated here, mitigates the negative impact of NC Descending, and further lowers, the influence of NC Ascending tools, by enforcing cost-utility analysis, adopting base-level reference point, and enabling more flexible item composition.

The study contributes to: a) information systems, by uncovering detailed dynamics of the interactions between information delivery and the user; and b) boundaries of reference dependence, thus, loss aversion.

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# 1 MOTIVATION

## 1.1 Motivation, Research Problem, & Research Questions

In 2017 over 1.6 billion consumers around the world purchased products online (Online shopping and e-commerce worldwide, 2017) and sales reached 2.3 trillion USD. Although e-commerce sales have so far largely involved product purchases, online service sales have been on the rise: constituting only 3.8 % of all Internet-based sales, but gradually increasing (by 11.8 % from 2013 to 2014) (U.S. Department of Commerce, 2016). (Celent, 2007). One of such service items is constituted by health insurance which post Affordable Care Act reform, has been under strong consumerization process (Russell, 2014) and, thus, an increasing number of consumers purchase their healthcare coverage online, using decision tools provided by Health Marketplaces and private broker websites. Consumers frequently find it challenging to process health plan options and overspend online (Abaluck, Gruber, & NBER, 2016; Zhou & Zhang, 2012). Their ability to choose low-cost health plans which meet their needs depends on many elements such as policy-related (e.g. the number of available options) (Zhou & Zhang, 2012), presentation format (e.g. price format display) (Andrew J. Barnes, Hanoch, Wood, Liu, & Rice, 2012), and individual factors such as one's level of comprehension of health insurance (Andrew J. Barnes, Hanoch, & Rice, 2015).

Many of the tools available to the consumers share design features with commonly used product recommendation agents (RAs) (Xiao & Benbasat, 2007, 2014), by for instance, enabling the user to sort through available plans and filter them based on specific attributes, according to the user's preferences.

Health insurance purchase decisions are not however, parallel to other types of purchases. They are highly complex, consumers often adopt price heuristics during the decision making process (Ericson & Starc, 2012) and are sometimes made in peculiar circumstances, such as under high perceived risk (or, for instance, enforced by legislature).

Although when choosing health insurance, consumers are largely driven by minimization of cost (Ericson & Starc, 2012), paradoxically, as a result, they often end up losing money (Heiss, Leive, McFadden, & Winter, 2013). Arguably, a number of various factors can affect consumers' ultimate (such as paying a higher deductible) – as well as immediate (paying a higher premium) - consequences of the choice of a particular health plan, and online decision tool design may be one of them. Consumers' need for coverage alongside their increasing reliance on online decision tools to make their purchase choices, calls for an investigation of the impact that the usage of these tools has on consumers' decision quality. It is imperative that we examine whether online decision tools are indeed supportive of such decisions, and under what conditions they would enable the user to reach varying degrees of decision quality. For instance, in the circumstances where the user is focused on price, is it conceivable that information delivery formats of e-commerce platforms related to price can exert differential – potentially negative - impact on users' decision quality? Is it conceivable that such effects can vary in different circumstances? Although our dependability on online decision tools is growing, the impact of these systems, and, thus, our capacity to develop improved ones, is still not yet fully known.

Early research concerning decision support systems analyzed decision tools from the perspective of their potential to improve such aspects as decision quality (Todd & Benbasat, 1992), efficiency (Silver, 1991), and accuracy-effort tradeoff (Chenoweth,

Dowling, & St. Louis, 2004). However, the outcomes of these investigations vary partially because of contextual differences among tasks and conditions (Song, Jones, & Gudigantala, 2007; Todd & Benbasat, 1992). Research has so far attempted to reconcile these differences, by, for instance considering the intricacies of the similarity between the tool's decision making process and the consumer (Aksoy, Bloom, Lurie, & Cooil, 2006), or by taking into account differential impact of user's expertise with the product on the effect of task transparency on preferences and product evaluation (Kramer, 2007). However, the impact of online decision tools on user's decision performance remains inconclusive.

Extant decision support literature has extensively examined the effects of tool design (Song et al., 2007; Tan, Teo, & Benbasat, 2010), choice set size (Kamis, Koufaris, & Stern, 2008) and the interaction between them (Kamis et al., 2008) on user's purchase behavior. The majority of this research has focused on purchase intention, with little papers examining specifically user's decision quality (Song et al., 2007; Tan et al., 2010).

Furthermore, extant research has noted that the effectiveness of decision tools is contingent upon a number of factors, such as user's characteristics (e.g. domain knowledge), product characteristics (type and complexity), elements associated with the interaction between the user and the tool, as well as characteristics of the decision tools (with regards to the type of the tool, its input, process, and output it generates) (Xiao & Benbasat, 2007). Despite an extensive body of research on decision tools, calls for research have been raised to investigate the role of the different elements related to the user and the decision tool characteristics, in the impact of online decision tool usage on user's decision quality, as a number of such elements have been overlooked (Xiao & Benbasat, 2007, 2014).

Furthermore, scant research exists examining the characteristics of the alternatives provided by the decision tool to the user, and even more so, very little investigations have been done into the characteristics of the options as well as the way in which they are presented by different tool designs – output content and output format (Xiao & Benbasat, 2007, 2014) – which, this paper, refers to as *information delivery* (literature review is shown in Table 1). Minority of papers investigating output content include studies such as (Senecal, 2003) who examined the effect of product cross-recommendations on user's purchase intention and showed that users are more likely to purchase the alternative when it is recommended. Research focusing on output format is slightly greater in number and generally differentiates between presenting the information in a sorted vs. non-sorted fashion (Xiao & Benbasat, 2007, 2014).

Additionally, although the role of contextual elements in the effectiveness of online decision tools has been recognized, recent studies which have examined it, also didn't focus on its effect in the impact of decision tools on user's decision quality (Lee & Benbasat, 2011).

Sorting the available items by a category of choice (for instance relevance, average customer reviews, newest arrivals, or price) constitutes one of the most common design features of online decision tools, included in virtually every recommendation agent. Using this feature results in presenting the alternatives in an ordered fashion, depending on the attribute the user has decided to sort the options on. This feature is based on (or, more explicitly, constitutes an application of) the most fundamental type of non-compensatory decision strategies, which is lexicographic-by-attribute strategy. Non-compensatory strategies are analogous to heuristics, whereby a high value of one attribute does not

compensate for a low value of a different attribute (J. W. Payne, Bettman, & Johnson, 1993; Song et al., 2007).

Scholarship has noted that under different conditions, the reliance on the tool could yield different results and calls for further research have been raised (Tan et al., 2010). Although each decision is contextual, IS literature has so far not paid sufficient attention to the different decision contexts (circumstances/ environments) in which the user can find themselves in, which can influence their preferences and decision strategies, thus, potentially, impacting the effectiveness of the decision tool. Limited literature in this area includes decision context studied by (Lee & Benbasat, 2011) who examined the differential effect of the user being in a loss or gain situation and showed that in loss conditions the decision tool can negatively impact attribute trade-off difficulty, and, furthermore, the negative effect perceived effort on decision tool usage intention is weaker under loss conditions. Although the widespread adoption of online decision tools has triggered a rather extensive body of research investigating their effect on user's decision performance (Haubl & Trifts, 2000; Song et al., 2007; Tan et al., 2010; Xu, Benbasat, & Cenfetelli, 2014), very sparse number of studies attempted to investigate the alignment of a decision tool and the contextual dynamics of decision processes that is, under what conditions an online decision tool would indeed be helpful to the user.

Furthermore, although decision strategy has been investigated as a factor influencing the impact of an online decision tool on user's decision quality (Aksoy et al., 2006), little research exists that studies the role of user's decision strategy when making online purchases and how that can differ as context, salient to the nature of the decision, changes.

Differing dynamics between the decision tool and the user's decision strategy can have varying effects on their decision quality, which requires further investigation.

In order to address the above-mentioned insufficiencies in research, this paper focuses on output characteristics (content and format) and examines the conditions under which they can positively or negatively impact user's decision quality. This study examines a single-attribute non-compensatory (NC) tool design, specifically, one of the possible attributes based on which the user may sort the alternatives, that is, price - sorting either in ascending Low-High (here referred to as *NC ascending*) or descending High-Low (here referred to as *NC descending*) fashion. It investigates the effect of information delivery in the form of output characteristics that can occur in an NC decision tool and output format embedded in the design of NC tool and considers whether, and if so, under what conditions, such output characteristics may negatively impact user's decision quality. Empirical evidence touching upon the effects of price order and price characteristics on consumer's choice is available in price presentation order (Suk, Lee, & Lichtenstein, 2012) and price anchoring (Ariely, Loewenstein, & Prelec, 2003). However, this research has not paid sufficient attention and has not sufficiently examined these mechanisms in varying conditions (decision contexts) that could impact user's preferences and decision strategies, and thus, change the dynamic of price order and price anchoring effects.

This study further proposes an alternative tool design, which could potentially mitigate the negative impact of certain output characteristics in non-compensatory tool design.

Moreover, this study extends this investigation by examining the role of user's decision quality and decision context in the relationship between the decision tools and user's decision.

Therefore, the main objectives of this study are to:

- investigate mechanisms embedded in information delivery in the form of output characteristics: output content and output format of a non-compensatory tool, which may potentially drive the user to overspend in an online environment in different decision contexts (peculiar to the decision type), thus negatively impacting their decision quality
- identify alternate online environment features which could potentially mitigate this negative effect
- inspect how the effectiveness of these mechanisms may differ for different users

By focusing on the health insurance context, the following research questions are proposed:

1. How can the design of an online decision tool affect user's purchase decision?
2. How can such an effect be mitigated?
3. Which consumers are particularly vulnerable to this effect?

Particularly:

4. What is the effect of non-compensatory online decision tool usage on buyer's decision quality?
5. What is the effect of a customization-based online decision tool usage on buyer's decision quality?
6. How will these effects vary for consumers under different levels of perceived risk and who differ in the decision approach they undertake?

To address the above-mentioned research questions, this study builds upon the findings of prior research concerning:

- non-compensatory and compensatory decision rules
- online decision tools: recommendation agents and customization-based tools
- decision under risk: particularly risk perception, availability heuristic, and simulation heuristic,
- reference dependence and loss aversion
- behavioral pricing: decoy effect, price-order effect, and options framing

Specifically, this study examines the effect of usage of a non-compensatory tool and argues that using a non-compensatory tool can have a negative effect on user's decision quality, as a user making a purchase choice with a non-compensatory tool presenting the alternatives according to price in a descending fashion will pay a higher price than with non-compensatory tool ascending. It is further proposed that using a customization- based tool, which enforces cost-utility analysis, results in positive decision quality, as the tool design adopts a base-level reference point, and enables item customization, which ultimately lets the user spend less on their item. It is further argued here that characteristics of the output in the form of price anchoring can differentially influence user's decision quality.

This study also investigates the effect of user's decision approach and how it can moderate the relationship between decision tool usage and user's decision quality. Specifically, it examines how user's price-heuristics - oriented decision approach affects their usage of a

non-compensatory and customization-based tools, whereby the price paid by the users who are strongly driven by cost will not differ regardless of the tool being used. The decision tools will have a differential effect on users' decision quality for users weakly driven by price heuristics. Judgment error evoked by information presentation thus plays a role, but it further depends on user's decision approach.

It further analyzes the impact of contextual factors associated with the decision environment of the user by looking at how, depending on the circumstances, for instance, for users under high perceived risk, the effect of the decision tools will be different than for users under low perceived risk. It is argued that decision context plays a role in the salience of the attributes of the options, thus affecting the effect of the decision tools on user's choices.

# 2 LITERATURE REVIEW

## 2.1 Information delivery: Output Format & Output Content

If we are to consider a decision tool and its usage, there are at minimum four core elements, including three process-related factors, which would need to be recognized and examined. Those elements include: a) the type of the decision tool (the way in which the tool is designed to process the decision, e.g. filtering method); as well as (at process-level) b) input (e.g. information related to user's preferences for the choice), c) process (characteristics of the tool informing the user about the progress such as time left to complete the search of potential alternatives meeting user's criteria), and d) output (the ultimate presentation of the available options) (Xiao & Benbasat, 2007, 2014).

It is the latter element – the output – that provides the information to the user about the item alternatives which are available, hence, *delivers the required information*, and it constitutes a vital part of the tool, as it is here, where the user chooses an option for them. It can be related to the way the decision tool is designed and its complexity level, for instance a single attribute non-compensatory tool will generate an output as a sorted list, but not necessarily so: a more sophisticated tool based on compensatory design may also provide the output as a list (or in other ways, such as columns facilitating comparison of options).

In any case, the output of a decision tool can be characterized by two features: 1) the format, and 2) the content of the output (Xiao & Benbasat, 2007, 2014). The format of the output pertains to such elements as the way in which the alternatives are presented, that is, whether they are sorted or non-sorted, or to the number of options presented in a single page (Xiao & Benbasat, 2007, 2014). The content of the output relates to the actual characteristics of

the alternatives being displayed such as their ratings (Xiao & Benbasat, 2007, 2014), the attributes included, or prices offered. The characteristics of the alternatives can refer to any attribute (price, color, dimensions, etc.) and may be random, for instance when the decision aid belongs to an independent merchant (and offers items from various providers) or may be, in one way or another, related – if the items are, e.g., from a single vendor.

| Literature investigating the effects of usage of information delivery on decision quality. | | | | | | |
|---|---|---|---|---|---|---|
| Paper | Setting | NC tool vs. tool type | Information delivery: Output format vs Output content | Independent Variables | Dependent Variables | Findings |
| (Tan et al., 2010) | • Washing machines<br>• mini audio systems purchase | • Non-compensatory (single - attribute based support),<br>• Non-compensatory (multiple - attribute based support),<br>• Compensatory based | Output format | • Decision tools (non-compensatory and compensatory)<br>• Attribute load | • Decision quality<br>• Perceived decision quality<br>• Decision time<br>• Perceived system quality | Single-attribute – based decision support yields higher decision quality and higher perceived decision quality than multiple-attribute – based decision support when attribute load is low. Perceived decision quality is lower using single-attribute based tool than multiple-attribute based tool when attribute load is high. |
| (Song et al., 2007) | Apartment rental | • Non-compensatory<br>• Compensatory | Output format | • Decision tools (non-compensatory and compensatory) | • Perceived effort | Non-compensatory decision support is perceived as less |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | • Perceived accuracy<br>• Perceived effectiveness<br>• Consistency with user preferences<br>• Satisfaction | accurate and yields decisions less consistent with user's preferences. |
| (Aksoy et al., 2006) | Cell phones | • Compensatory with ordered output<br>• Compensatory with unordered output | • Output format<br>• Output content | • Ranked list of options with similarity High-Low<br>• Perceived decision strategy similarity High -Low<br>• Output ordered vs unordered | • Objective decision quality<br>• Subjective decision quality<br>• Perceived benefits of using the agent<br>• perceived costs of using the tool<br>• information search<br>• Conformity to output<br>• Website satisfaction<br>• Repurchase intention | Decision strategy or attribute similarity between the user and the decision tool yields higher dissimilarity. Dissimilarity yields no difference between choosing from an ordered or unordered set. |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | • Intention to recommend website | |
| (Diehl, 2005) | Birthday e-cards | Non-compensatory | • Output format<br>• Output content | • Search costs<br>• Item recipient<br>• Number of recommendations<br>• Ordered output | • Decision Quality<br>• Selectivity | Making the choice from a list of options sorted from best to worst encourages consideration of more options and reduces user's selectivity resulting in lower decision quality |
| (Diehl, Kornish, & Lynch Jr., 2003) | Postcards | • Non-compensatory ordered<br>• Non-compensatory random | • Output format<br>• Output content | • Sorted list ordered (ordered by quality or expected net price) vs random<br>• Choice set size<br>• Order of recipient<br>• Sequence of search<br>• Order of recipient<br>• Trial (1 vs. 2)<br>• Sorted list ordered vs random<br>• Relative importance of price in the reward function | • Price of the chosen card<br>• Quality of the chosen card | Users pay a lower price when output is ordered than when it is unordered. In ordered searches, price is marginally lower if output is large than if it is small. With ordered search and large choice set, quality of chosen item is higher.<br>Multiple uses of ordered output |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | • Order of search | | decreases the price paid even further. If quality is more important than price, price is higher when output is ordered than random. If quality and price are equally important or if price is more important than quality, price paid is lower in an ordered set. |

*Table 1 Literature examining the effects of information delivery on decision quality.*

A very common output format constitutes a sorted list which can be generated by a single-attribute non-compensatory tool. Such sorting fashion may be based on different factors, such as average customer review, featured, or price high-low and low-high. When the output is sorted by price, for instance, the alternatives are presented in a top-down fashion starting either from the most to the least expensive alternative – or vice versa.

Although the alternatives are generally organized by increasing or decreasing cost, such an output may still vary in terms drops or gains in price, and, furthermore, by the attributes included by those options. Thus, output content further adds to the information delivery.

## 2.2 Decision context

Decision context carries a number of meanings and, in the extant literature, has been defined in many ways: as characteristics of the situation that the user is at or the characteristics of the choice set[1].

Situational factors – elements such as the circumstances that individuals find themselves in or the framing of the decision problem frequently influence individuals' decision - making processes (Das & Teng, 2001; Daniel Kahneman & Tversky, 1979; March & Shapira, 1987; Schoemaker, 1990). For instance, individuals tend to be more risk averse in gain situations and more seeking in loss situations (A. Tversky & Kahneman, 1991), and, furthermore, a particular decision maker can behave differently in terms of risk taking

[1] In this paper the term 'choice set' and 'consideration set' are used interchangeably, as the choice sets used in the experiment also serve as consideration sets for the user.

depending on how they consider their situation – positive or negative (that is, higher or lower the reference point that is of interest) (Bateman & Zeithaml, 1989a, 1989b).

Decisional context can also impact individual's preferences, whereby preferences can be formed at the time of making the decision (J. W. Payne et al., 1993). It has been also recently proposed that decision makers don't even necessarily engage in value assessment but, depending on the context of the choice (defined as characteristics of the alternatives available) they can learn choice strategies distinctive to the choice set (Amir & Levav, 2008).

In any case, however decision context is defined, it can impact the decision - making process of the user and ultimately, the choice that make.

In this paper, decision context is defined as the level of perceived health risk evoked by a real-life situation and personal risk factors. Individuals can often exhibit an increased risk perception for a medical outcome, which can influence their preferences and decision-making process, thus a choice between a person with higher vs. lower risk perception, will differ. Experiencing an increased perceived risk can impact one's anticipated health services needs and, via their willingness to mitigate the possible consequences of the medical condition and the need to utilize different health services, impact the extent of coverage and/or the price (premium or deductible).

### 2.3 Decision approach

Decision strategy constitutes a series of actions taken up in order to convert decision maker's initial (original) knowledge into a concluding (final) state of knowledge, whereby the individual feels that his decision problem has been settled (Riedl, Brandstätter, &

Roithmayr, 2008). From a theoretical standpoint decision strategies differ from information search behavior, but consociate with them in a number of cases (Takemura, 2014). Decision strategy used by the individual in his choice will involve elements of information search (for instance evaluation of the options available resembles assessment of information collected).

Features which differentiate various choice strategies include aspects such as: a) amount of information processed (e.g. the DM may or may not consider all attributes); b) the way in which the information is evaluated (assessment may be done alternative-wise, that is, considering the values of attributes one option at a time, or attribute-wise, whereby the DM studies the values of a single attribute across alternatives before taking another attribute into account); c) consistency of amount of information processed across attributes and d) alternatives; e) method of exclusion of undesired alternatives; f) employment of attribute weights or lack thereof; g) employment of a threshold for acceptable value level or lack thereof; h) method of dealing with conflicting values of attributes of a single option; i) extent of application of quantitative and qualitative reasoning for the purpose of alternative evaluation (Hastie & Dawes, 2001; Riedl et al., 2008).

Decision makers adapt their approaches to processing the available options and information on them to facilitate the decision process depending on the task structure or given situation (Gigerenzer, 2001; Simon, 1956). Decision strategies are not stable and can change across contexts (Russo & Dosher, 1983), with changes in aspects of the decision task such as complexity level (Swait & Adamowicz, 2001), or environmental structures (Mata, Schooler, & Rieskamp, 2007). One of the aspects that can affect individual's decision making approach is objective (motivation), as it has the potential to influence one's focus

on different aspects of the choice/ available alternatives (Carstensen, Isaacowitz, & Charles, 1999; Lockenhoff & Carstensesn, 2007).

For instance, consumers who are highly price conscious exhibit preferences for low prices and, thus, consider the available options with a focus on the cost (Lichtenstein, Ridgway, & Netemeyer, 1993). Those consumers seek products and services that meet their needs while relying on price (Lichtenstein et al., 1993). Price consciousness may be defined as the extent to which an individual 'focuses exclusively on paying a low price' (Lichtenstein, Bloch, & Black, 1988; Lichtenstein et al., 1993). It can be a personal characteristic, but also it may be a generally observed trend among the consumers in a particular choice context or item, for instance it has been noted that consumers frequently are driven by price when choosing health insurance for purchase (Abaluck & Gruber, 2011; Ericson & Starc, 2012).

In this paper, decision approach is defined as decision maker's tendency to focus solely on price during a particular purchase choice task.

### 2.4 Online decision tools

Decision aids (both IT- and non-IT- based) may be used to support the choice process and help achieve a better quality decision (Shim et al., 2002). A number of decision support tools are web-based and encompass individual features and capabilities, such as recommender systems (Haubl & Trifts, 2000) or constitute software or applications designed fully as decision aids (Bharati & Chaudhury, 2004).

The most essential feature of a decision tool is the mechanism supporting generation of the evoked set based on user's evaluation criteria. Online RAs design components that sustain

this process are mostly grounded on the support of compensatory, non-compensatory, or hybrid decision strategy types (Xiao & Benbasat, 2007). Compensatory and non-compensatory decision rules are driven by DM's preferences and the importance he assigns to particular choice attributes, but they differ in the way they handle these preferences.

The majority of online decision tools for multiattribute alternative evaluation are based on these information - processing practices, enabling the user to assess options using these different approaches.

### 2.4.1 Non-compensatory decision rules

Non-compensatory rule is alike a heuristic, whereby the DM does not face value conflicts, but evaluates the options based on a cut-off point of the most substantial attribute(s), and disregards the other attributes (Bettman, Luce, & Payne, 1998; Hogarth, 1987). This strategy eliminates unneeded options and facilitates the choice process by reducing cognitive effort. Two main ways in which non-compensatory strategies are carried out include single-attribute and multiple-attribute screening (John W Payne, Bettman, & Johnson, 1993).

### 2.4.2 Non-compensatory decision tools

Non-compensatory designs for option assessment usually involve features such as: filtering by a particular attribute (e.g. showing only a subset of alternatives – only those which meet the desired level of a certain attribute), sorting facility (e.g. sort by price, by customer review, etc.), or choosing a desired/acceptable threshold for a given attribute.

Non-compensatory online tools (NC tools) have so far been studied from the perspective of information overload (Song et al., 2007; Tan et al., 2010; Xu et al., 2014), yet little attention has been paid to the contextual factors surrounding the decision process, which may possibly play a role in the effectiveness of these tools in terms of user's decision quality. (Song et al., 2007) showed that non-compensatory – based tools are inferior to compensatory-based tools with respect to user's perception of their accuracy, effectiveness, effort involved, satisfactoriness, as well as coherence with user's preferences. (Tan et al., 2010) compared the effects of decision tools in high and low attribute load conditions and found that usage of single attribute non-compensatory tools results in higher decision time, lower perceived decision quality when attribute load is high, and is associated with lower perceived system quality than usage of multiple-attribute – based tools.

Furthermore, presenting alternatives in a sorted order from the most advantageous to least advantageous may still result in lower decision quality, as user's evaluation of other items is associated with a reduced average quality of examined items and user's selectivity is decreased (due to concentration on lower quality items) (Diehl, 2005). (Diehl et al., 2003) studied how ordering of item recommendations based on item quality influences consumers' choices when price and quality are and are not correlated. They found that, when there is a positive price-quality relationship assumed, presenting the user with alternatives ordered by quality can result in higher or lower prices paid depending on the relative importance of price in utility function, such that: a) when importance of price is greater than the slope of quality on price, then users pay lower prices; and b) when importance of price is less than the slope of quality on price, then users tend to pay higher prices (Diehl et al., 2003). Accordingly, users choose higher quality items if the relative

importance of quality is greater than the slope of price on quality, and will choose lower quality items if quality importance is less than the slope of price on quality (Diehl et al., 2003). It has been further shown that, when price and quality are not correlated, users will choose a lower priced item when presented with alternatives in an ordered fashion rather than unordered, as the ordered presentation provides them with better options on top of the list, and the top items are close substitutes in terms of quality (Diehl et al., 2003).

(Dellaert & Haubl, 2005) for example, investigated these types of tools in terms of their ability to present items in the order of their anticipated appeal to the user, and compared user's decision process when assisted by the tool and user's choices when unassisted. They showed that users provided with recommendations evaluate alternatives in 'choice mode', that is, they focus on evaluating utility and picking the best option out of the ones presented with (Dellaert & Haubl, 2005). When making the choice when provided with recommendations, users compare an item to others, previously identified items in the set; and, further, when evaluating items of greater variability, users tend to search less than with no recommendations (Dellaert & Haubl, 2005).

Research shows that in contradistinction to presenting the user with options in a random fashion, choosing from alternatives sorted according to user's preferences results in higher decision quality (Diehl, 2005) and lower prices paid (Diehl, 2005). It has also been shown that when provided with item recommendations in an ordered fashion (although with a decision tool based on a WADD strategy) is positively related to user's objective decision quality when user's attribute weight and decision tool's attribute weight are similar, as compared to an unordered fashion (Aksoy et al., 2006).

### 2.4.3 Customization - based online decision tools

Customization-based decision tools provide decision support by enabling the user to construct the product and services according to the user's preferences and needs (Ives & Piccoli, 2003; Kamis et al., 2008). The tools display specific attributes and metrics characterizing the attributes and permit the user to construct the product or service by picking and choosing the parameters to custom design the item. The tools can provide the user with specific attributes or attribute packages (sets of attributes) for the user to arrange to their liking. Usage of customization-based tools is associated with greater perceived usefulness and perceived enjoyment experienced by the users (Kamis et al., 2008). Those types of decision tools also perform better in terms of supporting complex decision tasks in the sense that they alleviate the decline in perceived ease of use and perceived control which users experience with non-customization-based tools when task complexity increases (Kamis et al., 2008).

## 2.5 Presentation Bias

In the online environment, research has discussed the issue of bias in usage of search engines (sometimes referred to as *presentation bias*) (Bar-Ilan, Keenoy, Levene, & Yaari, 2009). Scholarship has examined users' tendencies in their utilization of search engines and showed that individuals are generally biased towards top results, yet sometimes they look into lower ranked records (Keane, O'Brien, & Smyth, 2008). The boundaries of this phenomenon still remain inconclusive. On the one hand, presentation bias was shown to be substantial by (Bar-Ilan et al., 2009) who showed that users value the ranking of the record and consider it the most important factor determining the quality of the record. On the other hand, research has found evidence indicating that record position is not the only

factor that plays a role here and with less applicable results positioned on the bottom of the search results, users pay more attention and consideration into the process of evaluation of the results (Lorigo et al., 2008).

## 2.6 Prospect theory

Prospect theory (Daniel Kahneman & Tversky, 1979; Amos Tversky & Kahneman, 1992) constitutes a theory of choice across risky alternatives with known outcome probabilities, and was proposed to be more aligned with human cognition which expected utility theory does not take into account. The theory was advanced on the basis of findings that: a) individuals prefer certain gains to uncertain ones of an equivalent assumed magnitude; and b) favor uncertain losses over certain ones of an equivalent assumed magnitude (Daniel Kahneman & Tversky, 1979; A. Tversky & Kahneman, 1986; Amos Tversky & Kahneman, 1992). The theory is concerned with the way decision maker makes their choice (rather than the final outcome of the decision) and posits that they approach the alternatives from a standpoint/reference – concerning income and wealth level.

Prospect theory delineates decision process as occurring in two phases: *editing* and *evaluation* (Daniel Kahneman & Tversky, 1979). In the first stage, the decision maker chooses which outcomes they perceive to be equivalent, establishes a reference level, and then deems greater outcomes as gains and lesser ones as losses. The objective of this phase is to mitigate framing and isolation effects. During the second stage, the individual acts as if they were computing decision utility and picks the option exhibiting highest utility (value). The corresponding formula delineating the second phase may be represented as follows:

$$V = \sum_{i=1}^{n} \pi(p_i)v(x_i)$$ , where

V – overall expected utility value of the outcomes

$x_1, x_2, x_3, \ldots, x_n$ – potential outcomes

$p_1, p_2, p_3, \ldots, p_n$ – probabilities of corresponding potential outcomes

v – value function of an outcome

Here the individual makes their choice with reference to changes in income – represented as possible either gains or losses – which occur relative to the reference level rather than the actual level itself. That is, if gain increases, then the gain considered from the reference point, will diminish in value; and if loss increases, then the loss considered from its reference point, will lessen in negative value. Since more weight are assigned to losses than gains: the marginal gain in value derived from a gain in income level is less than the marginal loss in value derived from income (wealth) loss of an equivalent magnitude (Figure 1 Value function of losses and gains).

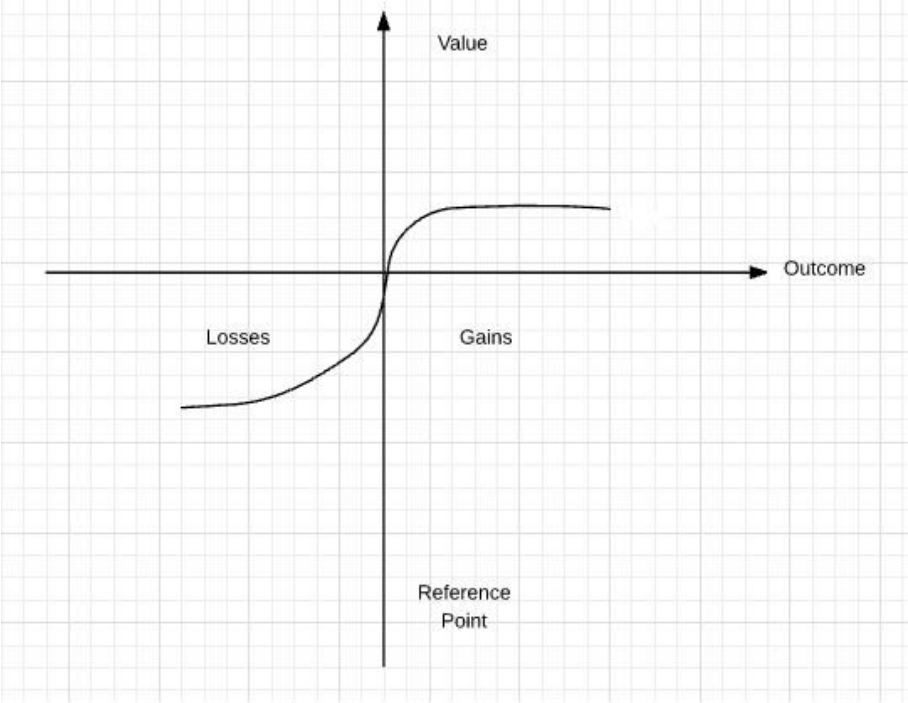



*Figure 1 Function of gains and losses.*

Because value is ascribed to losses and gains, rather than actual outcomes, the value function (Figure 1) is defined on alterations from the reference level. Prospect theory posits that depending on the contextual scenario individuals may involve in two types of risk-taking behavior: risk seeking and risk aversion, each one delineated via the value function. The function is concave for gains (indicating risk aversiveness), and convex for losses (indicating risk seeking). The function is also normally steeper for losses than for gains, signifying loss aversive nature of decision makers.

Due to the relationship between the concavity-convexity shape of the function and the fact that low probabilities tend to be overweighed, the two *risk attitudes* indeed occur in a *four-fold pattern.* Individuals are inclined to be more risk averse when gains are of moderate- (fear of disappointment), or losses of small- (fear of loss) probability; they also tend to take up a risk seeking approach when losses are of moderate- (hope to circumvent loss) or gains of small- (hope of a great gain) probability.

The main advantages of prospect theory over expected utility theory include: 1) demonstration that individuals prefer uncertain losses revises the explanation regarding insurance demand; and 2) consideration of alterations in utility levels done from a reference point constitutes a more useful clarification of consumer behavior (Nyman, 2003).

### 2.6.1 Loss Aversion

Loss aversion constitutes the disparity between one's appraisement of gains and losses (Daniel Kahneman & Tversky, 1984). That is, it is decision makers' preference to evade a potential loss than to obtain a corresponding gain. Loss aversion has been defined as the influence of a changing reference level on indifference curves (A. Tversky & Kahneman, 1991). Whenever an alternative is evaluated against the reference standard, it is judged with regards to the advantages and disadvantages it brings. Furthermore, when considering pairs of alternatives, discrepancies between disadvantages are of greater impact (psychological difference to the decision maker) than equivalent variations between advantages (Daniel Kahneman, 1992).

In scenarios where the reference level is constituted by status quo, disadvantages of an alternative to the status quo resonate with the individual more heavily than its advantages, causing a bias towards maintenance of the status quo (Samuelson & Zeckhauser, 1988).

### 2.6.2 Reference Dependence

Reference dependence theory posits that decision maker's choice depends on a reference point (level) (A. Tversky & Kahneman, 1991). The position of the reference standard impacts the evaluation of an outcome as either as a gain or loss. Due to the differences in

assessment of gains and losses the appraisal of an outcome will influence decision maker's preferences (Daniel Kahneman, 1992). The individual considers the possible change as either a gain and an advantage, or as a loss and a disadvantage; whereby losses influence one's preferences and choices more heavily than gains.

Although reference dependence and anchoring bias are similar in their effects, and are frequently used synonymously; reference dependence deals with gains and losses valued asymmetrically, whereas anchoring impacts one's judgment of an object in a more general context (Daniel Kahneman, 1992).

### 2.6.3 Framing Effects

A *framing effect* constitutes a cognitive bias which arises when equivalent depictions of a choice problem direct decision makers towards systematically diverse choices (A. Tversky & Kahneman, 1981). Framing effects have been extensively studied in terms of their potential to undermine classical rationality approach and considered to support incoherence in decision processes.

Hitherto, literature has identified and demonstrated three major types of framing effects: 1) attribute framing effects; 2) goal framing effects; 3) risky choice framing effects (Levin, Schneider, & Gaeth, 1998). These effects differ in terms of their operationalizations, their distinctive outcomes, and hypothesized underlying mechanisms (Levin et al., 1998). Attribute framing is characterized by a different (positive or negative) valence of a single attribute (positively described items tend to be evaluated more favorably by individuals) (Levin et al., 1998). Goal framing involves adoption of a persuasive message which focuses on either positive or negative consequences of a particular behavior (persuasive effect of a

negatively-framed message is rooted in human loss aversion) (Levin et al., 1998). Last, but not least, risky choice framing effects entail different risk approaches of decision makers, that is risk seeking or risk aversion, depending on whether the decision problem is framed positively (in terms of gain or success rate) or negatively (in terms of loss or failure rate) (Levin et al., 1998; A. Tversky & Kahneman, 1981).

## 2.7 Anchoring

Anchoring constitutes a type of cognitive bias whereby an individual strongly depends on the first piece of information he is provided with (that is, the *anchor*) when making a choice (Amos Tversky & Kahneman, 1974). The individual considers that piece of information a reference point which influences his assessment of further options. In the classic experiment the subjects were asked to estimate a multiplication of figures 1 to 8: once in ascending and once in descending order (Amos Tversky & Kahneman, 1974). The estimations were significantly higher for the descending sets than ascending sets. Anchoring effect thus pertains to scenarios whereby the decision maker's estimation or judgment of a possible outcome is influenced by a stimulus, often unrelated or uninformative (Amos Tversky & Kahneman, 1992).

Individuals judgment may be impacted even by context-irrelevant cues and a variety of types of anchors: numerical as well as non-numerical. Physical stimuli, such as line length, object's (such as pennies) weight or music loudness may also be accompanied by anchoring. Individuals, when asked to reconstruct the magnitudes of these stimuli, judge their estimates differently; when exposed to a small anchor (short length, light object or quiet music), they generate lower estimates (LeBoeuf & Shafir, 2006). Non-numeric anchors may skew numeric assessment (Oppenheimer, LeBoeuf, & Brewer, 2008), for

instance subjects asked to estimate the length of the Mississippi River, and shown a longer line beforehand, expressed greater evaluations.

## 2.8 Relative pricing

Research has uncovered a number of ways in which different formats of price presentation and the ways in which alternatives are presented to the user with regards to their pricing, can influence decision maker's choice.

### 2.8.1 Decoy Effect

Alternatives in choice sets can exhibit various types of relationships and those different relationships can exert various effects on decision maker's preferences and choices. This mechanism has been coined in the literature as the 'decoy effect' (Doyle, O'Connor, Reynolds, & Bottomley, 1999; Huber, Payne, & Puto, 1982; Zhang & Zhang, 2007). There are three types of decoys which can be differentiated: asymmetrically dominated decoy (Heath & Chatterjee, 1995; Huber et al., 1982); a phantom decoy (Highhouse, 1996); and a compromise decoy (Simonson, 1989). Phantom decoys dominate the target but are presented to the decision maker as currently unavailable (Highhouse, 1996); compromise decoys constitute alternatives which influence decision makers' choices towards intermediate options rather than extreme ones (Pettibone, 2012; Simonson, 1989).

When alternatives of higher price are also of higher quality, the choice set is set to be symmetrically dominated. It is possible, however, for a choice set to include an option which is asymmetrically dominated (superior in certain attributes such as cost, but lower in other attributes) – the *decoy* - this option guides the decision maker to refocus their attention to a different alternative – the *target* – which is high in all the attributes (Huber

et al., 1982). The other option in the choice set are lower in attributes of the items (Huber et al., 1982). When faced with such a choice set, the decision maker is expected to choose the target option, as it constitutes value to them.

### 2.8.2 Options framing and price-order effect

#### 2.8.2.1 Options framing

Consumer purchase decisions vary depending on how item choices are presented to them. Decision makers who are provided with attributes enabling them to customize the item ultimately purchase a different number of attributes and pay a different total price for the item when they begin the customization process with a basic (single) attribute than when they begin the process with a fully customized item (consisting of all possible attributes) and then subtract the attributes from it (C. W. Park, Jun, & Macinnis, 2000). This effect has been coined as options framing effect (Biswas & Grau, 2008; C. W. Park et al., 2000). Two particular types of option framing have been studied: additive (starting from the base model and adding ancillary options to it, each one at a given cost) and subtractive (starting from the full model and taking out options from it) (Biswas, 2009; Biswas & Grau, 2008; C. W. Park et al., 2000; Peng, Xia, Ruan, & Pu, 2016). When provided with an additive option framing, each addition of an option constitutes a gain, but a loss in monetary sacrifice, whereas when making the choice in subtractive option framing, each deduction of an option constitutes a loss in utility, but a gain in cost (A. Tversky & Kahneman, 1991). Considering losses carry a heavier weight to an individual than gains, in the former condition consumers ultimately choose less options and pay a total lower price than in the latter condition.

#### 2.8.2.2 Price order effect

In a similar fashion to options framing, price – order effect, whereby prices are presented gradually increasing or decreasing (without options being explicit and provided to the individual to customize) also demonstrates differential choices for consumers (Suk et al., 2012). When provided with a price list starting from the highest to the lowest, individuals tend to purchase more expensive items, than when presented with a price list in an ascending order (Suk et al., 2012).

## 2.9 Debiasing

Debiasing refers to approaches, techniques, and methods aimed at minimizing, or eradicating the effects of cognitive biases (Fischhoff, 1982). It can be done by providing the decision maker with warning messages and explanations of bias, or training them on task execution (Fischhoff, 1982).

Due to the profound impact of the anchoring effect on human judgment, extant research has attempted to debias it – or find alleviating mechanisms - in various contexts, such as estimation of productivity - in software engineering (Haugen, 2006; Mair, Shepperd, & Jorgensen, 2014; Ralph, 2011; Shepperd, Mair, & Jorgensen, 2018), integration of sequential information in intelligence work (Wickens, Ketels, Healy, Buck-Gengler, & Bourne, 2010), assessment of weather conditions by pilots (Walmsley & Gilbey, 2017), health-related and medical judgments (Lau & Coiera, 2009; Ludolph, Allam, & Schulz, 2016; Mumma & Wilson, 1995) as well as numeric estimates (Block & Harper, 1991; G.B. Chapman & Johnson, 1994; Hoch & Schkade, 1996; Smith & Windschitl, 2015; Welsh, Begg, & Bratvold, 2007), and specifically, price evaluation (George, Duffy, & Ahuja,

2000), item value estimations (Gretchen B. Chapman & Johnson, 1999) and offer values in market negotiations (Galinsky & Mussweiler, 2001; Ritov, 1996; Whyte & Sebenius, 1997).

These studies use a variety of approaches to address anchoring mitigation, and in addition to particular methods or tools used for debiasing, research has attempted to investigate boundary effects of anchoring and tried to utilize that knowledge to minimize its effect, also in the context of numerical assessments (G.B. Chapman & Johnson, 1994).

Extant attempts to alleviate the anchoring effect with a decision support system or information presentation, are scarce.

(George et al., 2000) designed and developed a decision tool to support user's decision making for house price evaluations. The tool included basic information about and photos of the house to be appraised, information on other houses (available for sale or recently sold), pricing advice and clues (factors that influence property appraisal value such as its distinctiveness, prices of comparable houses, or seller's emotional approach to the decision) and a warning message. The warning message advised the user from estimating the house value around the anchor price and were shown to the user if their appraised price was too close to the anchor price (+-10% or +-20% within the range of the anchor). The authors investigated whether differences such as a striking message (presented in bright red and large font) vs simple one, would have a differential effect on user's estimated value, however there was no difference for the messages in either format. Their intervention was unsuccessful though, in that the provision of the warning message had a significant impact on the number of times the users changed their appraised value, but did not influence the value itself or its distance from the anchor (George et al., 2000).

(Lau & Coiera, 2009) aimed to mitigate order effect (anchoring one's judgment based on the time and order of information presentation) - which can occur in users' online information search processes - in order to positively impact the outcomes of these search (user's conceptual understanding and confidence in their knowledge). The authors focused on healthcare consumers' search for medical information using a search engine, as they had previously reported order effect during its use (Lau & Coiera, 2007). The authors noted that after the user retrieves documents in their search, the way these records were ordered will influence user's perception and understanding of the concepts ingrained in them, and thus their proposed debiasing solution constituted an interface to the search engine, which would reorganize these records in an order counter to the initial order bias (Lau & Coiera, 2009). The rearrangement of the records was carried out by an algorithm designed to model the initial order effect. The implementation of this debiasing DSS was partially successful, in that the order effect was mitigated (the authors did not observe a significant order effect among users using the interface), however it did not have any impact on the accuracy of user's answers to conceptual questions, or user's confidence in those answers (Lau & Coiera, 2009). The authors however, pointed out that the algorithm they used for debiasing was not entirely accurate in modeling ordering bias, which could have an impact on its effectiveness.

## 2.10 Risk

The very term 'risk' may be equivocal, as in the literature it has been defined and approached in a variety of ways: it has been used to refer to a hazard, probability, or ramifications of an event (Nicholson, Soane, Fenton-O'Creevy, & Willman, 2005). Despite

these differences, the most substantial way of defining risk in the literature is the 1) probability of an adverse outcome and 2) severity of its consequences (Sjoberg, 1999). These two elements have been used both separately as well as combined.

Scholarship within the stream or prospect theory has so far traditionally defined risk as the probability that a specific outcome might happen; individuals have to choose between two options – one which provides a certain outcome, and another one, which provides an uncertain outcome (Rothman, Bartels, Wlaschin, & Salovey, 2006).

This study focuses on subjective risk (individual's subjective assessment of the likelihood of an adverse outcome), whereby the perceived risk constitutes decision maker's evaluation of the probability of developing the illness.

### 2.10.1 Perceived vs. Objective Risk

Scholarship at large differentiates between objective and perceived risk, regard for each one in literature depending fundamentally on philosophical stance and, in practice, on one's objective.

Positivist perspective stresses the importance of objective risk, focuses on its conceptualization and measurement, and disregards the existence of subjective (perceived) risk (Mitchell, 1999). Objective risk is quantitative, can be measured, computed and/ or observed (Knight, 1921). Past occurrences and frequency of a certain event are recorded and calculated to estimate future level of risk for the event. An objective degree of risk exists separately from individual's assessment of it, and signifies 'authentic' outcome probabilities (Conchar, Zinkhan, Peters, & Olavarrieta, 2004).

Relativist school of thought on the other hand concentrates on individual's perceived risk and views it as the main type of risk which should be measured. Both in research and practice not all perceived risks and their conceptualizations are created equal, and are strongly embedded (and construct definitions dependent upon) within the context of a given phenomenon (Conchar et al., 2004). Two factors however have been recognized as pertinent to the conceptualization of perceived risk: uncertainty and adverse consequences (Bauer, 1960).

Uncertainty here constitutes lack of exact knowledge of a probability of a future event (in contradistinction to objective risk which involves computation of such a probability). This is particularly relevant to everyday situations which consumers find themselves in, where they are able to neither foresee future events nor evaluate their probabilities (Stone & Grønhaug, 1993). It is indeed perceived risk which may have the most substantial impact on consumer behavior and assist the most in *explaining* consumer behavior (Mitchell, 1999).

Adverse consequences may be defined as 'importance of loss' (Taylor, 1974), and have been distinguished as related to performance, social context, safety, financial and psychological implications (Jacoby & Kaplan, 1972). Time also poses a level of risk to the consumer, as product failure may be associated with time loss (e.g. required for repair) or loss of convenience (Roselius, 1971). These elements may impact consumer's risk perception independently, such that when one level of risk raises, a different one may raise, go down, or remain unchanged. Furthermore, individual in a purchase situation may face a considerable 'tradeoff' across risks, for instance buying overspending on grocery supplies

for a dinner party may decrease the host's performance and social risk, but increase their financial risk (Jacoby & Kaplan, 1972).

Despite the different approaches of positivism and relativism towards risk, it has been noted that both are rather integrated in their practical approach towards risk (Mitchell, 1999). Positivism recognizes the behavioral effect and implications of perceived risk, thus the need to measure such risk; while relativism may potentially acknowledge objective methods considering the relativist and individual standpoint that will be measured.

#### 2.10.1.2 Perceived risk and heuristic processing

Perceived risk is defined as decision maker's subjective assessment of the probability of an adverse outcome (P. Slovic, 1987; Paul Slovic, Fischhoff, & Lichtenstein, 1984).

As individuals respond to cues and external stimuli in a dual-mode fashion (Daniel Kahneman, 2011), they may approach a risk situation: 1) in a logical, reasonable way, analyzing the implications of choice; or 2) in an intuitive, narrative, and affective way (Epstein, Pacini, Denes-Raj, & Heier, 1996; Paul Slovic, Finucane, Peters, & MacGregor, 2004). In practice, the majority of risk evaluation is executed spontaneously, via *experiential* mode of thinking (Paul Slovic et al., 2004).

When a consumer is faced with a situation or stimuli related to an adverse outcome, he is likely to process it heuristically, impacting his judgment of risk level and actions taken upon it (Folkes, 1988; Keller, Siegrist, & Gutscher, 2006; Amos Tversky & Kahneman, 1973). It has been shown, for instance, that individuals exposed to media coverage, personal past experience, or occurrence in one's environment of an event, influences the perceived probability of such an event occurring to the person (D. Kahneman, Slovic, &

Tversky, 1982; Amos Tversky & Kahneman, 1973). The individual processes this information via *availability heuristic* – the ease of recall of event's exemplar instances (Amos Tversky & Kahneman, 1973). The ease with which an event can be brought to consumer's mind, that is, the retrieval of that event, will guide that individual to judge the incident's future occurrence as probable, whereas difficulty of retrieval – as improbable (Folkes, 1988; Schwarz et al., 1991; Amos Tversky & Kahneman, 1973). Furthermore, remembering images associated with the event may be connected to individual's emotion and affect, thus providing an adaptive response to stimuli, and increasing one's perceived risk (Paul Slovic et al., 2004).

Literature has so far explained availability heuristic in terms of the ease of recall of examples of an instance (Amos Tversky & Kahneman, 1973), ease of retrieval (Schwarz et al., 1991), and memory accessibility (MacLeod & Campbell, 1992). The more easily the event can be constructed or imagined, the higher the probability estimate the individual will assign to it (Schwarz et al., 1991).

## 2.11 Health insurance purchase choices

When choosing a health insurance plan, consumers tend to pay attention to information on plan cost and benefits included (Booske, Sainfort, & Hundt, 1999; Tumlinson, Bottigheimer, Mahoney, Stone, & Hendricks, 1997); they tend to satisfice and their preferences are largely influenced by their expected (perceived) needs for health services and cost (Mechanic, 1989). Accordingly, lack of owning health insurance by a large number of young adults can be at least partially explained by low anticipation of prospective health services utilization (needs) (Mechanic, 1989). Since health insurance constitutes a choice of an item which will mitigate the consequences of an adverse

outcome, rather than a protective measure, the potential adverse outcomes tend not to be pertinent at the moment of the decision, thus consumers frequently purchase a plan that covers essentials and minimizes cost (Mechanic, 1989). This differs for consumers depending on their demographics such as age or health status (Mechanic, 1989). Generally, policy seekers apply price heuristics and lean towards less expensive plans (Ericson & Starc, 2012).

Various sociodemographic/personal background, consumers' cognitive and affective responses, as well as aspects pertaining to the decision environment can affect consumer's choice of a health plan and the way they approach the decision.

Individual's numeracy and cognitive reflection result in a greater Medicare enrollment probability, thus indicating that seniors with lower numeracy skills may need to be provided with support in enrollment (Szrek & Bundorf, 2014). Furthermore, more numerate individuals, those exhibiting greater understanding of health insurance and those aligning their decisions to their preferences were more likely to choose a less expensive plan (Andrew J. Barnes et al., 2015). Personal factors affecting consumer's overspending on health insurance plan include individual's age, race (non-Caucasian) and gender (females) (Zhou & Zhang, 2012). Consumers with mental conditions were also shown to purchase cheaper plans that those not suffering from such conditions (spending on average $10 less per year) (Zhou & Zhang, 2012). Contextual factors such as plan characteristics also affect overspending (for instance added generic coverage, or choosing a plan without deductible results in higher overall overspending on policy) (Zhou & Zhang, 2012). Factors such as gross drug spending, patient's risk score, chronic conditions, experience did not contribute to individual's overspending on insurance policy (Zhou & Zhang, 2012). Task

complexity (choice set size) and individual's age constitute drivers of plan comprehension errors and inconsistency in decision making (Finucane, Mertz, Slovic, & Schmidt, 2005). They further elaborated that the impact of age may be explicated by social factors, health profile and one's cognitive skills such as processing speed, short-term memory, basic numeracy skills, as well as indices of physical and emotional health (Finucane et al., 2005). Research has also investigated whether individual's numeracy significantly predicts his comprehension and choice of a lower cost plan (Consumer-Directed Health Plan CDHP), and found that, although less numerate individuals exhibited lower understanding of CDHP, they were more likely to choose it (Greene, Peters, Mertz, & Hibbard, 2008). The authors further examined whether format of presentation of alternatives (side-by-side vs common/unique) could potentially improve health plan comprehension, yet showed mixed results: a framework highlighting differences across plans improved understanding on items associated with the framework messaged, but aggravated it on items unrelated to it (Greene et al., 2008). Individual's focus on price, rather than taking into consideration various plan attributes, negatively influences his plan selection and leads to overspending (Heiss et al., 2013).

In terms of contextual factors, research has mostly discussed the overchoice effect and how the number of coverage plan options may influence consumer's decision behavior. Although literature generally agrees that a greater option set is detrimental to the person's choice, the dynamics of how that happens are not exactly clear. On the one hand, research has analyzed the influence of a larger choice set on decision-making in older and younger individuals and found that decision performance is higher with only a few options (Wood et al., 2011). They further showed that seniors' decision-making performance was

substantially lower across conditions and that numeracy plays a significant role in decision performance. Seniority of age and higher number of choices result in poorer choices of Medicare drug plan, that is picking overly expensive plans (Hanoch, Rice, Cummings, & Wood, 2009). Numerate individuals perform better when faced with a small set of alternatives, but not with a large set (Szrek & Bundorf, 2014). They also showed that the size of option set has very little impact on the performance of less numerate individuals (Szrek & Bundorf, 2014). On the other hand research has shown that the variation in potential financial savings across states stems from the differences in alternative sets, not individuals' capability to choose (little variation in terms of such characteristics as age or gender) (Abaluck, Gruber, & NBER, 2011). Numeric price frames (as opposed to percentage format) and choice set size negatively impact consumer's policy choice when decision quality is considered cost minimization (Andrew J. Barnes et al., 2012). Interestingly, brand names of providers did not have a significant influence on choice (Andrew J. Barnes et al., 2012). Choice set size has a negative impact on individual's choice of a cost minimizing plan and on time spent analyzing attributes of coverage plans (Andrew J. Barnes et al., 2013). Information overload in the form of too many possible alternatives may cause individual's confusion and economically suboptimal choices (Doonan & Katz, 2015). Consumers tend to use heuristics when purchasing a plan and overinsure (Kettlewell, 2016). Individual's decision quality is significantly lower when choosing bundled products, rather than stand-alone ancillaries cover (Kettlewell, 2016). Research has investigated different plan cost structures (higher vs lower out-of-pocket costs for medication the individual might need), and presentation formats, and showed that consumers make health insurance decisions consistent with expected utility theory

(consistent choices of either of the plans), and display of information in a graphical format further supports choice consistency (Bundorf, Mata, Schoenbaum, & Bhattacharya, 2013).

Attempts have been recently made to study presentation formats, and design features of platforms and decision tools that could support health insurance choice and improve policy seekers decision making. It has been posited that one of the difficulties of selecting health insurance coverage is lack of transparency concerning total cost estimates, and investigated whether demonstration of such information could influence consumer's decision performance (A. J. Barnes, Hanoch, Rice, & Long, 2016). Personalized information on total costs can improve the quality of individual's health insurance decision (A. J. Barnes et al., 2016). Based on information processing model, a decision tool tailored to the user's preferences and needs, and with an easy to understand presentation of alternatives, has been proposed (Politi et al., 2016). The tool - *Show Me My Health Plans* decreases cognitive burden and raises comprehension through plain language and graphics, interactive knowledge assessment, personalization of cost estimates, assessment of plan preferences, and adoption of algorithm to demonstrate best match between user's needs and available plans (Politi et al., 2016). By simplifying the complexity of health insurance choices, their tool could improve consumer's decision quality, however the empirical evidence is still lacking (Politi et al., 2016). Users of state health exchanges were more inclined into choosing a high-value plan when plan information was provided in the form of a summary, when star rating was attached adjacent to cost data, and when the plan was highlighted with a checkmark or ribbon (Greene, Hibbard, & Sacks, 2016). The authors found that individuals who understood quality star rating also performed better in terms of choosing a high-value plan (Greene et al., 2016). Provision of plan recommendations as a policy tool

supports users in selecting earnings maximizing plan (Andrew J. Barnes, Hanoch, & Rice, 2016).

### 2.11.1 Health insurance purchase under high perceived risk

Increased risk perception is associated with demand for insurance in a number of domains such as natural disasters (Kunreuther, 1996; Seifert, Botzen, Kreibich, & Aerts, 2013). Although health insurance purchase choice is often driven by legislation and during the decision process the consumers are largely guided by the cost of the plan (Ericson & Starc, 2012), the individual health insurance market is characterized by adverse selection (Browne, 1992) and consumers' personal factors such as health status or medical consumption can influence their demand for or choices of health insurance (Van de Veen & van Praag, 1981). Anticipation of health services needs (Mechanic, 1989) and perception of risk impact demand for coverage (for instance, consumers' increased perceived risk for long term care of their parents, is also associated with demand for such insurance) (Zhou-Richter, Browne, & Grundl, 2010).

# 3 MODEL & HYPOTHESES

## 3.1 Overall Research Model

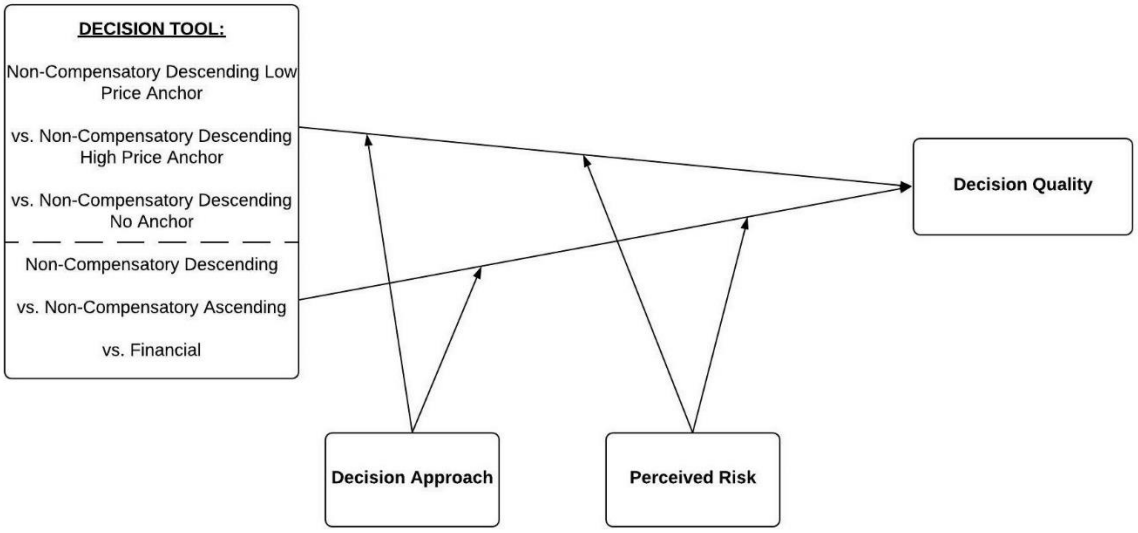



*Figure 2 Overall research model.*

## 3.2 Study 1 Research Model

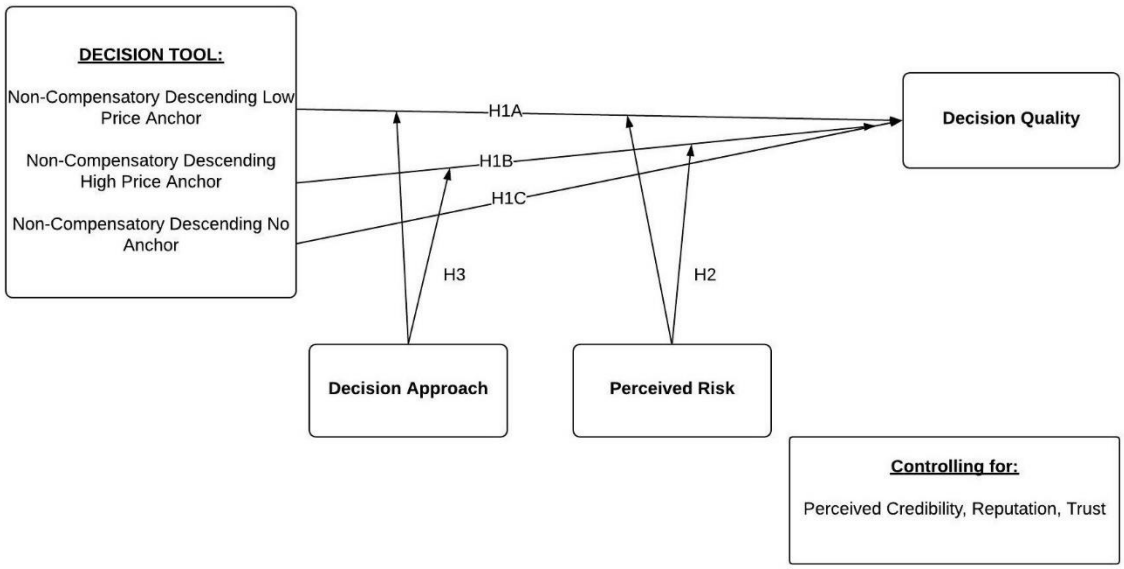



*Figure 3 Study 1 Research model.*

### 3.2.2 Definitions of Constructs

**Decision support tool** refers to an online decision support system facilitating a user's decision process; constitutes one type of tool: non-compensatory.

**Non-compensatory tool** constitutes a list of item alternatives sorted by price in a descending order (Price High – Low) and differentiates among three forms of output characteristics: 1) **High Price Anchor –** whereby the topmost alternative included in the choice set is asymmetrically dominated with large price increase and slight utility increase; 2) **Low Price Anchor** – whereby the topmost alternative included in the choice set contains a slight price increase and slight utility increase and the option beneath it is asymmetrically dominated; and 3) **No Anchor** – whereby the choice set does not include the item offered as topmost options in the first and second choice sets and the topmost option here is equivalent to the second from the top option in the first (with high price anchor) and second (with low price anchor) choice sets; this choice set does not contain an asymmetrically dominated item.

**Decision Approach** refers to user's approach when evaluating the given alternatives (or item attribute packages) and making the choice of an item (or customizing the item), and it is differentiated as a price heuristics-driven purchase decision approach (considering the available alternatives in terms of minimization of cost): **strong** vs. **weak**.

**Decision Quality** refers to user's decision quality when making the choice, that is when purchasing an item, measured in terms of final plan purchased by the user. Negative decision quality is constituted by overspending (purchasing a plan with higher price and

greater extent of coverage), and positive decision quality is constituted by not overspending (purchasing a plan with lower price and lower extent of coverage).

### 3.2.3 Hypotheses

In a choice set with an asymmetrically dominated item (better in certain attributes such as price), which serves as a decoy, the user is inclined to purchase the dominating item (higher in value) – that is, the target item (Heath & Chatterjee, 1995; Huber et al., 1982). The item asymmetrically dominated changes the focus of attention of the user away from itself and other options offered in the choice set and directs it towards the item greater in value.

In a choice set with the top item asymmetrically higher in price but not in utility (substantial increase in price but small increase in utility) (here referred to as NC Descending with a high-price anchor), the item with a small decrease in utility but a substantial decrease in price constitutes higher value, therefore the user will be inclined into purchasing it. In such a case the top item offered at a much higher price shifts the focus towards the item with a lesser extent of utility and greater decrease in price.

In a choice set including an item with a small decrease in price and small decrease in utility compared to the top item (here referred to as NC Ascending with a low-price anchor), the top item constitutes a higher value to the user, thus the user will be inclined into purchasing it.

In a choice set which does not include the top item - with either a high or small – increase in price (here referred to as NC Descending with no anchor), that is a choice set which lacks an asymmetrically dominated option, the user will purchase an item lower in price

and utility than if they were to choose from a choice set with a small increase in price and utility.

*H1. The effect of the usage of NC Descending tool with a low-price anchor will be negative and the effects of usage of NC Descending tool with a high-price anchor and NC Descending tool with no anchor on user's decision quality will be positive, such that:*

*H1A. Users will purchase the health plan with greatest coverage and highest price with NC Descending tool with a low-price anchor more frequently than with NC Descending tool with high-price anchor.*

*H1B. Users will purchase the second-most expensive and second in terms of extent of coverage – health plan using NC Descending tool with a high-price anchor more frequently than with NC Descending with a low-price anchor.*

*H1C. Users will purchase the health plan with greatest coverage and highest price with NC Descending tool with a low-price anchor more frequently than with NC Descending with no anchor.*

In situations of risk individuals engage in avoidance or precautionary behavior (Edwards, 1961; Janz & Becker, 1984; Daniel Kahneman & Tversky, 1979); unsafe environments motivate individuals to take precautionary measures (Paul Slovic & Weber, 2002). Under high perceived risk consumers engage in information seeking behavior (Kellens, Zaalberg, & De Maeyer, 2012), search conciliation and exhibit greater intention to prepare for risky events (Terpstra, 2011), and demonstrate heightened interest in purchasing insurance policies (Kunreuther, 1996; Zhou-Richter et al., 2010). Severity of the consequences of a

risky event is associated with individual's perceived importance of owning precautionary measures (such as insurance) to them (Sjoberg, 1999). The greater the seriousness of a risky occurrence, the greater the value of having a risk mitigation measure to the consumer.

Health insurance constitutes a peculiar type of precautionary measure, in the sense that it doesn't carry the meaning of protection per se, but merely alleviates the possible consequences of the adverse outcome. Consumers generally do not self-insure; and they do exhibit a general tendency to minimize cost incurred during insurance purchase (once the purchase transaction is taking place) (Ericson & Starc, 2012). It is therefore conceivable that under high perceived risk, consumers will seek to purchase coverage which would mitigate the possible consequences of an adverse outcome, while at the same time try not to pay a high price for it. They may for example wish to buy basic coverage which would enable them to mitigate the consequences of the adverse outcome, but they will still trade it off against cost minimization.

Therefore, under high perceived risk, the consumer will be willing to purchase an item with a greater level of extent of coverage to mitigate the consequences of the adverse event.

Users under low perceived risk, who don't experience an increased subjective probability of an adverse outcome, are likely to purchase a health plan that mitigates the consequences of general – most frequent - health adverse outcomes (generic health services) while minimizing cost. If the asymmetrically dominated and dominant options vary in terms of the prices and utilities, but utilities only differ in coverage mitigating the consequences of a specific adverse outcome, it is conceivable that those options will only be of interest to

the users under high perceived risk. Despite the dominant option offering a high value, it will not be of interest to the users under low perceived risk and those users will purchase an option that meets their needs while minimizing cost incurred.

Therefore, the items purchased with NC Descending with a high-price anchor and NC Descending with a low-price anchor will differ for users under high perceived risk. The purchase of the most expensive item will not differ significantly across those decision tools for users under low perceived risk.

*H2. Perceived risk moderates the effect of NC Descending with a high-price anchor and NC Descending with low-price anchor such that the effect of the usage of NC Descending tool with a low-price anchor will be negative and the effects of NC Descending tool with a high-price anchor will be positive on user's decision quality under high perceived risk, but not under low perceived risk.*

*Under high perceived risk the users will purchase the health plan with greatest coverage and highest price with NC Descending tool with a low-price anchor more frequently than with NC Descending tool with high-price anchor, but there will be no differences in this plan purchase for users under low perceived risk.*

When making a purchase decision, the user trades off the utility of available options vis-à-vis the cost association with those utilities. If provided with a choice set containing an asymmetrically dominated alternative, the user is likely to choose an option that seems of the most value to them (Heath & Chatterjee, 1995).

If a user, during their decision – making process, is primarily driven by price heuristics, that is their focus is on minimizing price and they don't pay attention to the utility of the items, they are likely to purchase an item with the lowest price regardless of the utility and value of the other items in the choice set. Those users will be making their decision solely on price and the cost-utility trade-off is likely to play a lesser role (Lichtenstein et al., 1988; Peng, Xia, Fanglin, & Bingyan, 2016). Although in most product or service purchases, consumers, even those driven by price consciousness, are likely to search for an item that meets their needs while minimizing cost, in the case of health insurance, it is conceivable for users to be driven purely by price with no consideration of the coverage benefits. For those users the effect of the HP Anchor and LP Anchor tools should not differ in terms of the most expensive plan purchased.

Users not focusing primarily on price minimization should be engaged in cost-utility trade-off, thus for them the effects of the tools should still hold.

*H3. Decision approach moderates the effect of NC Descending with a high-price anchor and NC Descending with low-price anchor such that the effect of the usage of NC Descending tool with a low-price anchor will be negative and the effect of NC Descending tool with a high-price anchor will be positive on user's decision quality for users driven weakly by price heuristics, but not for users driven strongly by price heuristics.*

*Users driven weakly by price heuristics will purchase the health plan with greatest coverage and highest price with NC Descending tool with a low-price anchor than the item purchased with NC Descending tool with high-price anchor, but there will be no difference in this plan purchase for users driven strongly by price heuristics.*

## 3.3 Study 2 Research Model

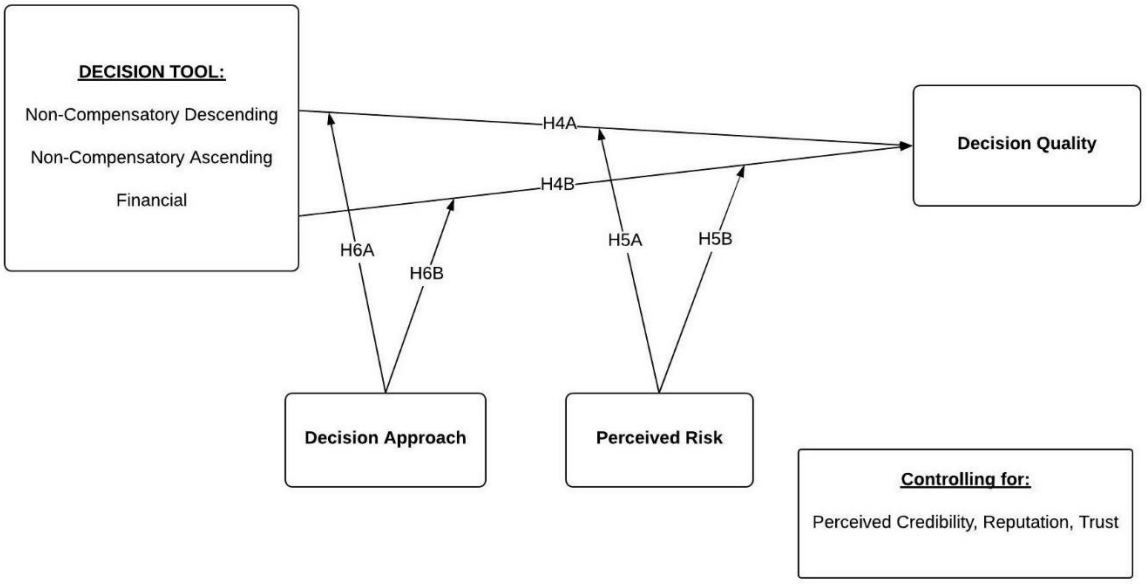



*Figure 4 Study 2 Research model.*

### 3.3.2 Definitions of Constructs

**Decision support tool** refers to an online decision support system facilitating a user's decision process; differentiates between two types of tools: non-compensatory and financial.

**Non-compensatory (NC) tool** constitutes a sorted list of item alternatives, provided in two formats: 1) **descending –** whereby the options are sorted by price in descending order (Price High-Low) and 2) **ascending** – whereby the options are sorted by price in ascending order (Price Low-High); and the **Financial tool** constitutes a list of item attribute packages and enabling customization of the item.

Choice sets in non-compensatory descending and financial decision tools are characterized by gradual decrease of price accompanied with gradual increase of utility, while choice set in non-compensatory ascending tool is characterized by gradual increase of price accompanied by gradual increase of utility. Choice sets in NC descending and NC ascending are the same, and choice set in financial tool is equivalent to them in price and utility (broken down to enable customization).

**Decision Approach** refers to user's approach when evaluating the given alternatives (or item attribute packages) and making the choice of an item (or customizing the item), and it is differentiated as a price heuristics-driven purchase decision approach (considering the available alternatives in terms of minimization of cost): **strong** vs. **weak**.

**Decision Quality** refers to user's decision quality when making the choice, that is when purchasing an item, measured in terms of final price paid by the user. Negative decision quality is constituted by overspending (purchasing a plan with a higher price), and positive decision quality is constituted by not overspending (purchasing a plan with lower price).

### 3.3.3 Hypotheses

Consumers institute their price judgments based on the initial price by adopting anchoring-and-adjustment heuristic (Northcraft & Neale, 1987; Paul Slovic & Lichtenstein, 1971; Amos Tversky & Kahneman, 1974). Consumers' choices are frequently impacted by a reference standard, as they examine available alternatives against a given point of reference (A. Tversky & Kahneman, 1991). When they begin consideration of alternatives sorted by price in an ascending order, they ultimately purchase a less expensive item, than if they

were to begin the evaluation process with alternatives presented in descending price (Suk et al., 2012).

Alternatives presented to the users in a hierarchical, price-oriented fashion can invoke reference dependence, whereby the judgment across cost and benefits is biased by the start point of the choice set and initiation of the evaluation of alternatives (Suk et al., 2012; A. Tversky & Kahneman, 1991). Presentation of price in a descending vs. ascending manner, results in consumers' choosing a higher price in the former condition and lower in the latter (ascending) condition (Suk et al., 2012). Thus, users making the choice using a non-compensatory tool when items are sorted by price are subject to reference dependence, whereby the results of the effect are contingent upon whether the user makes the decision with a choice set provided to them in an ascending or descending fashion.

When customizing the services that the consumers would like the item to include, they effectively purchase a smaller number of services when starting from the lowest possible number of attributes (base model) to the highest (full model) (Levin, Schreiber, Lauriola, & Gaeth, 2002; C. W. Park et al., 2000). The base item constitutes the reference, and each addition of an ancillary service constitutes a gain, but a loss in monetary sacrifice (Biswas & Grau, 2008; Carmon, Wertenbroch, & Zeelenberg, 2003; C. W. Park et al., 2000). The user ultimately purchases a smaller number of options and smaller price when considering alternatives starting from the lowest possible number of attributes (base model) to the highest (full model) (Levin, Schreiber, Lauriola, & Gaeth, 2002; C. W. Park et al., 2000). The base item constitutes the reference, and each addition of an ancillary service constitutes

a gain, but a loss in monetary sacrifice (Biswas & Grau, 2008; Carmon et al., 2003; C. W. Park et al., 2000).

The design of an NC tool generates a list of options sorted by a given attribute (in this case, price) thus guides the user to evaluate the alternatives starting from the top one, towards the bottom of the list. The users making the choice with a NC tool with alternatives sorted by price in a descending fashion are subject to reference dependence, with the top, most expensive item as their point of reference. Starting from the top option and examining the alternatives further down the list, the assessment of each alternative is associated with a loss in benefit but a gain in cost they would have to incur. As losses have a greater impact on human judgment, the user will be more inclined into purchasing a higher priced option, not willing to incur a loss in benefit.

Conversely, when making the decision with a non-compensatory tool with options sorted by price in an ascending fashion, the user begins their evaluation of the alternatives starting from a low priced one, moving forward with more and more expensive plans. Every new option being considered is associated with a gain in benefit and a loss in cost possible to incur (W. C. Park, Jun, & Macinnis, 2000; Suk et al., 2012). As losses exert a greater influence than possible gains, the user will be more inclined to purchasing a lower priced option than users making the decision with a non-compensatory tool with options sorted in a descending fashion. Thus, under high perceived risk, the price paid for the item will be

higher for users making the decision with NC descending tool than for users making the choice with NC ascending tool.[2]

The financial tool is based on customization of packages of attributes starting from the basic package (base level) up until the full item can be constructed – in a manner equivalent to the NC ascending tool, presented in two columns.[3] As the presentation of the attribute packages begins with the lowest attribute package, the user begins their examination of all packages with this option. The first attribute package constitutes a reference point, thus inducing a cost-benefit analysis with each consecutive option. Addition of each attribute package constitutes a gain in utility but a loss in price. As losses have a greater impact on the decision maker than prospective gains, similarly to NC ascending tool, under high perceived risk, the price paid with the financial tool should be lower than with NC descending tool.

Furthermore, customization of the item induces the user to consider each attribute package more thoroughly, encourages a meticulous trade off across attributes as well the attributes and the costs the user must incur for each one, and moves them away from a screening-driven evaluation of the available alternatives (Tan et al., 2010). It thus makes them more

[2] Although substantial evidence exists to show that presentation bias has been shown to affect user's evaluation of search results (users provided with options generated in a vertical (linear) fashion, tend to be biased towards top alternatives) (Bar-Ilan et al., 2009), some studies show that sometimes users abandon this bias, and examine lower ranked records (Keane et al., 2008). It remains inconclusive however, why this happens. It is conceivable that both reference dependence as well as presentation bias play a role here, however, as the choice set size is kept constant in this paper, the results are explained in terms of reference dependence (A. Tversky & Kahneman, 1991; Amos Tversky & Kahneman, 1974), rather than presentation bias (Bar-Ilan et al., 2009). However, it is conceivable that using customization-based tool would alleviate presentation bias (as well as reference dependence) – further research adopting various choice set sizes could test this.

[3] The design of the Financial tool assumes the user examines the options in an F-fashion.

involved with the information on available items and promotes a switch from heuristic processing towards more analytical-focused processing. Active and engaged processing of information by the decision maker is associated with less biased judgments (Hedwig & Natter, 2005). Particularly in situations when the user predominantly concentrates on a single parameter, such as price, it can be argued that customization encourages a shift from focusing primarily on that particular parameter and facilitating the user to pay more attention to utility as well, by enforcing cost-utility analysis.

Additionally, as part of financial tool design, the total price for the item which the user customizes is presented to them on a separate page, after the user has completed the customization process. The user is initially provided with the list of attribute packages to choose from, they then confirm that they have completed the customization with a button to move further, and then they are provided with a confirmation of all the attribute packages they have chosen as well as the total price for the item. The design rationale for this feature is that the overall price the user would have to pay is presented to them independently of any other price points. It is therefore expected that the user would examine the total price more objectively, and not in comparison to a different one. The tool provides the user with prices for each individual attribute package, which further enables them to refocus their attention from the total price to the separate additional costs the user would have to incur while adding the options.

Last, but not least, the confirmation page with the customized item and its total price, which follows the customization of the item, includes a warning message with a question for the user to affirm their choice and mentions potentially lower priced options. The incorporation

of such a prompt is designed to further encourage the user to reconsider their decision and motivate to re-customize their item onto a less expensive one.

Thus, it is hypothesized that usage of NC Descending tool, subjecting the user to reference dependence starting from a high priced alternative, will result in higher price paid by the user, therefore lower decision quality; while usage of NC Ascending and Financial tools, subjecting the user to reference dependence starting from a low price, will result in a lower price paid and, thus higher decision quality.

*H4. The effect of usage of an NC Descending tool on users' decision quality will be negative and the effects of usage of NC Ascending and Financial tools on user's decision quality will be positive, such that:*

*H4A. The price paid for health plan will be higher using NC Descending tool than when using NC Ascending tool;*

*and H4B. The price paid for health plan will be higher using NC Descending tool than when using Financial tool.*

When provided with customizable attribute options which can constitute either essential or tangential attributes, the price paid for chosen options and the number of tangential options chosen for purchase are higher when beginning evaluation of alternatives from full model than when beginning from base model (Jin, He, & Song, 2012). When considering the essential options for purchase, there is no difference in the number of options chosen or the price paid for them. Additionally, when presented with customizable attribute options either starting from a full or base model, with options being important and unimportant,

the users who customize their item starting from a full model purchase more options considered less important than those who begin their item customization from a base model (W. C. Park et al., 2000). There is no difference in choosing the number of important options by users customizing either starting from full or base model (W. C. Park et al., 2000).

Users under low perceived risk are likely to resonate with health plans including generic benefits, thus for those users there will be no significant difference in price paid using either of the decision tools. With a choice set including minimum 6-7/10 of the alternatives mitigating the consequences of developing a specific medical condition, it can be argued that such alternatives constitute tangential options for users under low perceived risk.[4] Users under low perceived risk should resonate mostly with options mitigating the consequences of generic adverse health events – those options should be of interest to them. Furthermore, as mentioned earlier, users who are under low perceived risk are likely to search for a health plan that would cover general – most common – health outcomes, while users under high perceived risk will be interested in purchasing a plan that would mitigate the consequences of (cover the cost of health services related to) that adverse outcome. If the output content of the decision tools contains lower priced options (5/10 covering generic and cancer health services and of those 2/5 cover only generic health services), the users under low perceived risk should only be interested in those plans. Users under low perceived risk are likely to consider only among the options related to generic health services.

[4] Although Plan Bronze Plus II covers only skin cancer and specifically targets this medical condition, it can be argued that Plan Silver, which is a level higher (as presented in NC Descending tool) covering all types of cancers, is also relatable to users under low perceived risk – covering general, various types of cancer.

Therefore, for users under low perceived risk examining the health plans using NC Descending, NC Ascending tool and Financial tools will result in no difference in price paid.

For users under high perceived risk, 6-8/10 options relate to skin cancer (7) or cancer, thus those users should resonate with the majority of the choice set. However, since 5/10 health plans are designed in such a way that there is a gradual increase in coverage (cash amount) for the same benefits, the users under high perceived risk should engage in cost-utility analysis when making the decision (at minimum for those 5 plans). Although all the options may be of general interest to the users under high perceived risk, if the options differ in the level of coverage purchased, they do not represent the same utility to the users (they do not simply constitute various benefits), thus, the decision is still subject to reference dependence.

Therefore, for the users under high perceived risk using NC Descending tool will result in a higher price paid (thus, lower decision quality), than using NC Ascending and Financial tools (thus, higher decision quality).

*H5. Perceived risk moderates the effect of NC Descending, NC Ascending, and Financial tools on users' decision quality such that the effect of usage of an NC Descending tool on users' decision quality will be negative and the effects of usage of NC Ascending and Financial tools on user's decision quality will be positive under high perceived risk but not under low perceived risk.*

*Under high perceived risk:*

*H5A. The price paid for health plan will be higher using NC Descending tool than when using NC Ascending tool, but there will be no differences for users under low perceived risk;*

*and H5B. The price paid for health plan will be higher using NC Descending tool than when using Financial tool, but there will be no differences for users under low perceived risk.*

When the user focuses on the ratio of utility vs. price, they tend to purchase more expensive items when deliberating on the possible alternatives starting from the highest priced (full model) to the lowest priced (basic model) (Peng, Xia, Fanglin, et al., 2016). This effect however does not occur when there is lack of trade-off between utilities and costs associated with them, for instance then the user is motivated purely by the enjoyment and satisfaction that the purchase can provide them with (Peng, Xia, Ruan, et al., 2016). When making a purchase choice with NC descending, NC ascending, and financial tools, the user is subject to reference dependence and the usage of those tools affect the user's decision quality, if the decision approach of the user, involves a trade-off across gains and losses. If the user is driven purely by a single factor during their decision, such as, minimization of cost, then their manner of considering the alternatives will no longer involve a trade-off across gains and losses, thus, the differential effects of the tools should no longer hold.

Similarly to options framing effect starting from a base model, each addition of a benefit will be considered in terms of its utility and potential costs that the users may incur. Thus,

users who are driven by cost-benefit analysis, will accomplish higher decision quality when using a customization-based and NC ascending tools than such users making the choice with NC descending tool. For those users the effect of NC descending tool will be negative.

Although when making purchase choices, consumers can take up different decision approaches related to their motivations, and, frequently, search for products or services that meet their needs – even if they are interested in minimizing the price they would have to pay - the case of health insurance is somewhat different. As consumers frequently are driven by price heuristics when buying health coverage (Ericson & Starc, 2012), they are likely to purchase plans for a low price that meet their minimal health services needs. It is further conceivable that some users who choose a health plan for purchase may be purely interested in picking a plan that is offered at the lowest price possible without considering any actual coverage benefits.

It is thus hypothesized that a user who is driven by price heuristics - defined as being driven primarily by minimization of cost - will not be involved in cost-utility analysis when examining the available options, and for those users, the effect of NC descending, ascending, and financial tools will not differ in terms of decision quality attained.

*H6. Decision approach moderates the effect of NC Descending, NC Ascending, and Financial tools on users' decision quality such that the effect of usage of an NC Descending tool on users' decision quality will be negative and the effects of usage of NC Ascending and Financial tools on user's decision quality will be positive for users driven weakly by price heuristics but not for users driven strongly by price heuristics.*

*For users driven weakly by price heuristics:*

*H6A. The price paid for health plan will be higher using NC Descending tool than when using NC Ascending tool, but there will be no differences for users driven strongly by price heuristics;*

*and H6B. The price paid for health plan will be higher using NC Descending tool than when using Financial tool, but there will be no differences for users driven strongly by price heuristics.*

# 4 RESEARCH METHODOLOGY

## 4.1 Experimental Design

### 4.1.1 Experimental Design, Participants, & Task

The experiment is similar to the way users evaluate product and service options for purchase online. Subjects participating in the study have been recruited from several different sources: a) students attending MBA and Master's degree programs at two major US universities in exchange for class credit b) faculty and staff at one of these universities in exchange for advancing knowledge c) respondents registered at Amazon Mechanical Turk (AMT) for a small financial incentive[5], d) social media users (LinkedIn, Twitter and Facebook) as a means of advancing knowledge[6][7], and e) users registered to receive the AIS mailing service (posted a link on AIS World)[8]. Not all of these segments have been recruited during the pilots as well as the actual experiment. All data collection has been done online.

The experiment consists of six major parts: 1) text containing basic information related to skin cancer (to control for respondents' knowledge) distributed to the treatment group; 2) pre-manipulation questionnaire; 3) text containing: 3.a) frequency information, and 3.b) scenario (combination of methods intended to induce simulation heuristic); 4) decision

[5] Age limitations were set up when collecting data on AMT in order to increase the age variance in the final dataset. US location was not set up as a restriction here.

[6] Due to a lack of permission to send a request to faculty and staff to participate, an invitation to this segment of respondents was not sent out, however, during data collection, certain respondents indicated that they received it, which was arguably confused with an email sent from AIS mailing service.

[7] US location and age above 18 were indicated as restriction for participation.

[8] US location and age above 18 were indicated as restriction for participation.

task; 5) text containing basic information related to skin cancer (to control for respondents' knowledge) distributed to the control group; and 6) final survey.

First, the participants are randomly assigned to one of two conditions: high perceived risk and low perceived risk (control). In the treatment group – high perceived risk – each respondent is provided with a short text with basic information on skin cancer, its symptoms, risk factors, and treatment options; and further, asked several questions which function to check respondents' level of knowledge of skin cancer, and serve as manipulation checks.

Secondly, both the treatment and control groups are asked questions relating to their general decision approach and major life events in the past 3 months.

Thirdly, the respondents are randomly assigned to one of two scenarios: 1) a scenario about visiting a cousin recently diagnosed with skin cancer; or 2) a scenario about visiting a cousin, having lunch, and hanging out together. Fourthly, each respondent is provided with a scenario asked to purchase a health insurance plan. As part of the scenarios, the respondents are then given instructions to purchase a health insurance plan as if they were in a situation as described in the scenario.

Fourthly, each participant is randomly assigned to one of three websites facilitating their choice. As part of Study 1, the websites (decision tools) include: 1) Non-compensatory Descending with a High - Price Anchor; 2) Non-compensatory Descending with a Low - Price Anchor; and 3) Non-compensatory Descending with no Anchor. As part of Study 2, the websites (decision tools) include: 1) Non-compensatory Descending; 2) Non-compensatory Ascending; and 3) Financial (based on customization of options).

Fifthly, the respondents in the control group are provided with the text with information on skin cancer and asked a few questions to check their level of knowledge and serve as manipulation checks.

Sixthly, all respondents (both in the treatment and control group) are provided with a final, full questionnaire measuring respondent's perceived risk, experiences with the website, decision-related constructs, health status, and healthcare utilization.

Finally, the respondents in the treatment group are provided with a short text serving as discomfort mitigation explaining the manipulation and encouraging them to speak to their physician to find out their true objective risk for skin cancer.

Participants are split into groups primed by different everyday life situations which might increase their perceived risk for developing a medical condition (in this case, skin cancer). The context for perceived risk is constituted by skin cancer, which serves as an example of an adverse outcome which consumers may face. The choice of skin cancer is motivated by several reasons: with varying frequency, but it can affect all ages, all races and both genders (Gloster & Neal, 2006; Mayer, Swetter, Fu, & Geller, 2014; Oberyszyn, 2008; Pearce, Parker, Cotterill, Gordon, & Craft, 2003), and individuals may still have a perceived sense of control over what they can do to minimize the occurrence.

The participants are able to make the experimental purchase of a health insurance plan using one of three types of websites:

- In Study 1, the tools include:
    - A simple sorted list of pre-established plans arranged by price with the top alternative having a high price (large increase in cost and small increase in utility

from second from the top alternative to the topmost alternative) and serving as an anchor

    - A simple sorted list of pre-established plans arranged by price with the top alternative having a price only slightly ($ 1) higher (small increase in utility and small increase in cost from second from the top alternative to the topmost alternative) than the second alternative and serving as an anchor
    - A simple sorted list of pre-established plans arranged by price with the top alternative constituting the alternative second from the top in the other tools – therefore having no anchor
- In Study 2, the tools include:
    - A simple sorted list of pre-established plans arranged by price in descending order
    - A simple sorted list of pre-established plans arranged by price in ascending order
    - Customization tool enabling the users to pick and choose specific coverage benefits and construct their insurance plan

Just as it is in the business realm, the health insurance plans offered include different coverage scopes and levels with corresponding different premium prices. The choice sets vary in the two studies, with choice sets in Study 1 increasing by price with the number of coverage benefits, and choice sets in Study 2 increasing by price with the extent of coverage (in terms of the extent of costs covered by the plan) for the same types of benefits in each alternative. Prices in Study 1 involve anchors (with large or small increase in cost), while prices in Study 2 increase – or decrease – gradually.

Both Study 1 and Study 2 are carried out as a joint data collection. An overview of the experimental design is provided below in Figure 5. The general view – flowchart - of the

Qualtrics survey encompassing both studies is shown in Figure 6 below and flowcharts for Study 1 and Study 2 are presented in Figures 7 and 8.

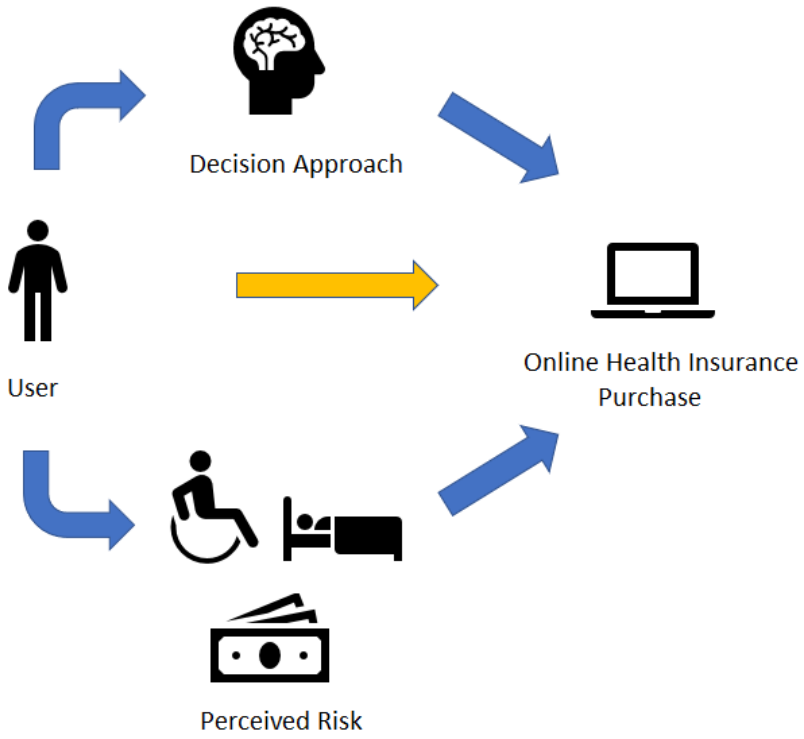



*Figure 5 General view of the experimental design.*

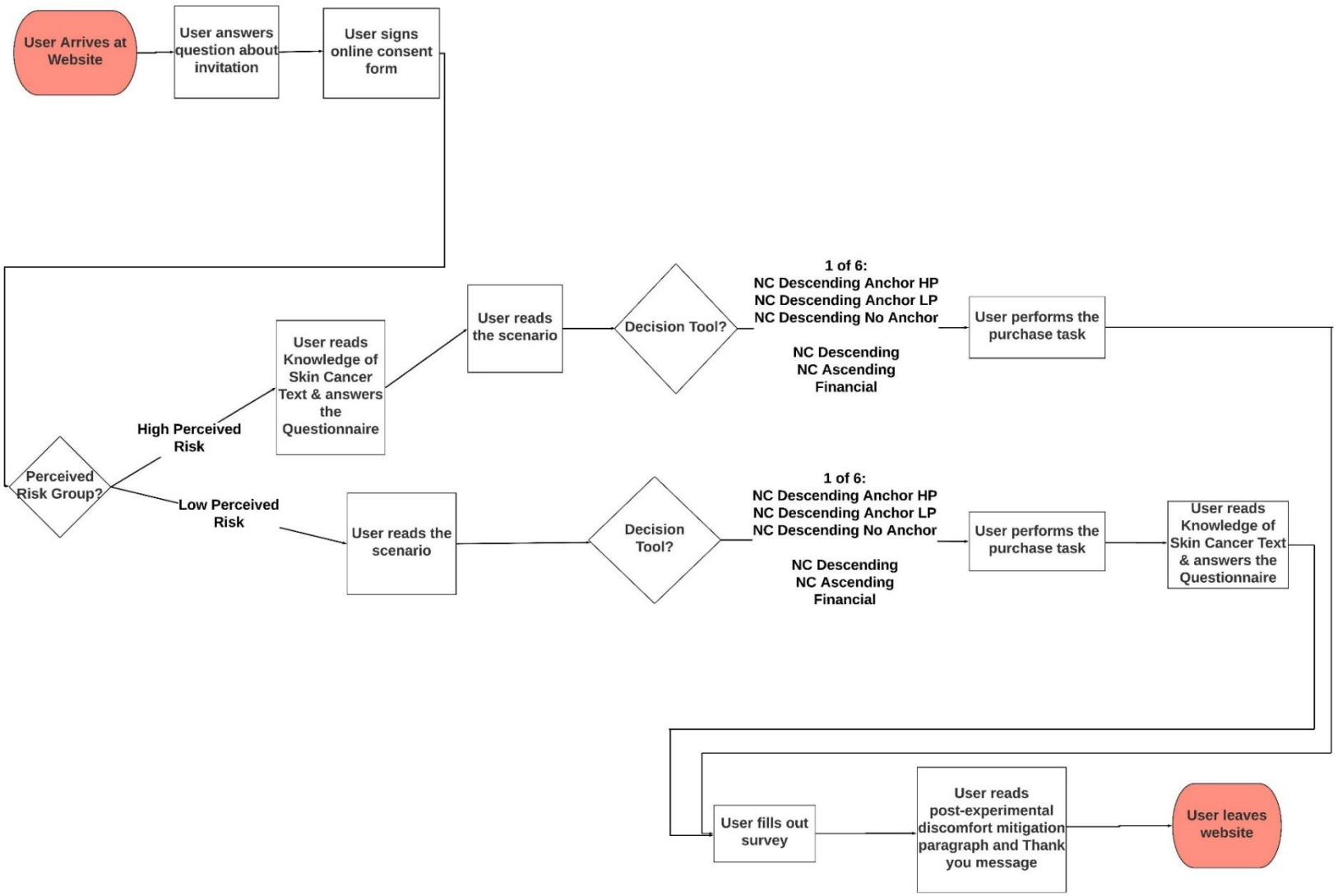



*Figure 6 Flowchart of overall experimental platform.*

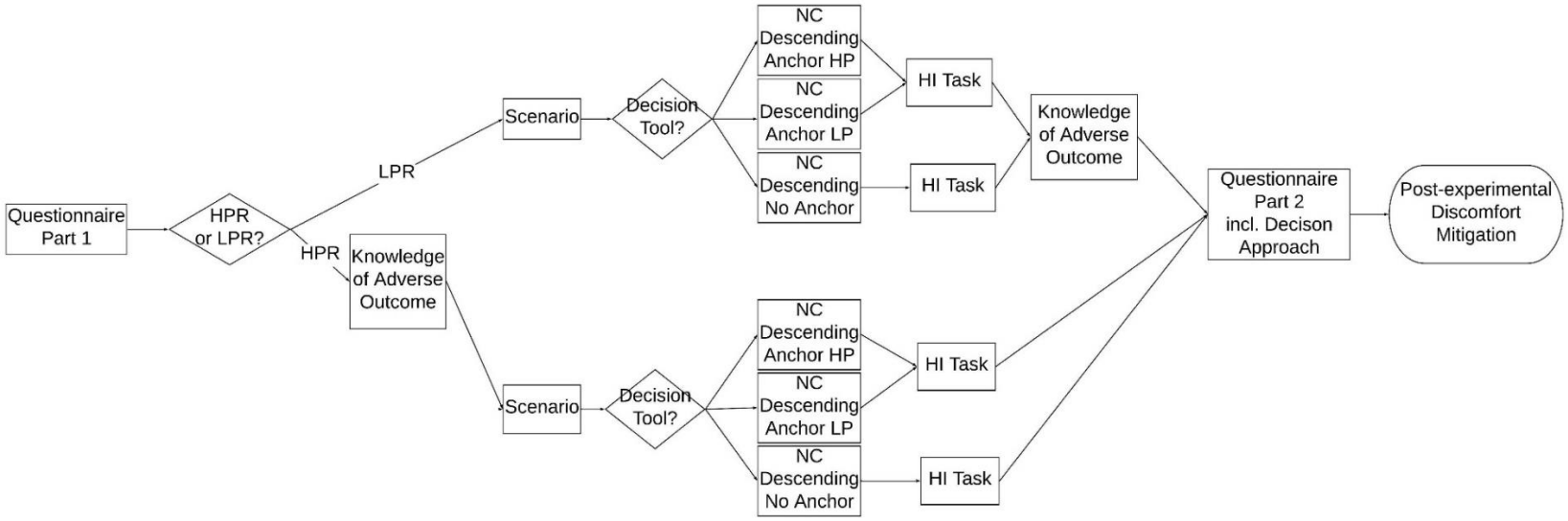



*Figure 7 Flowchart of the experimental design for Study I.*

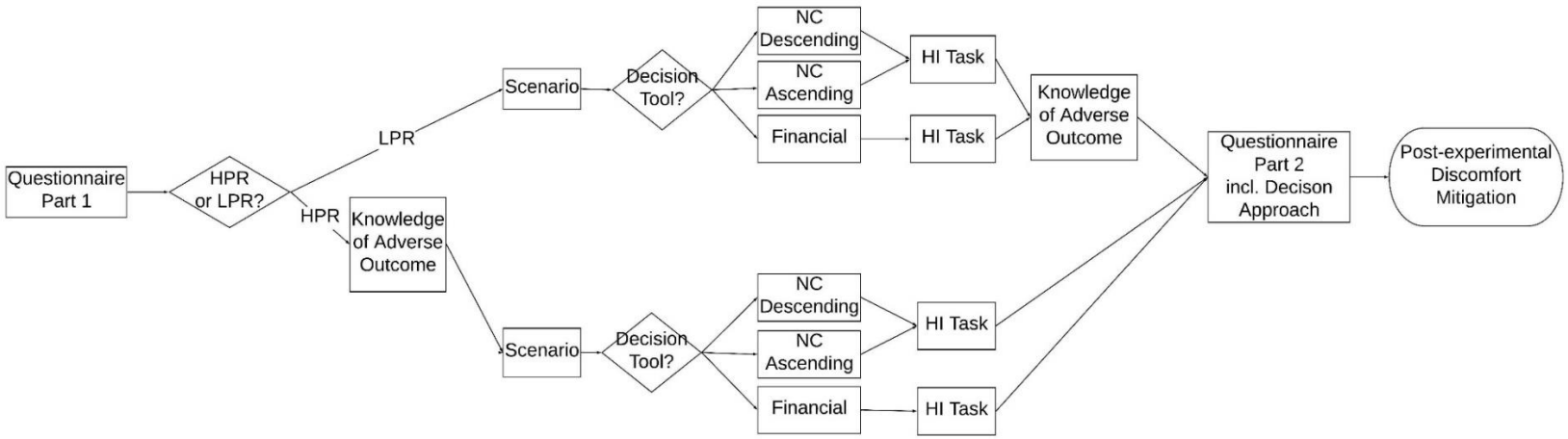



*Figure 8 Flowchart of the experimental design for Study II.*

### 4.1.2 Experimental Controls

Perceived credibility, reputation and trust for the website and health insurance brand are controlled mechanically, via web and coverage plans design. The design of both: the website and plans is done in a generic fashion, without mentioning any specific, well-known brand names.

Family history of adverse outcome (medical condition) is controlled for mechanically, via scenario design.

Additionally, although not controlled for, however, to account for knowledge of adverse outcome, the experimental design includes a scenario providing basic information on the medical condition and measures perceived comprehension of the information and respondent's involvement in reading the text. Prior exposure to the adverse outcome is measured, however not controlled for.

### 4.1.3 Demographics measured

Demographics established based on perceived risk literature (Palm, 1999; Sjöberg, Moen, & Rundmo, 2004), health insurance scholarship (Mathur, Paul, Prasad, & Das, 2015), and options framing (S. Park & Kim, 2012; Peng, Xia, Fanglin, et al., 2016).

Demographics measured:

- Gender
- Age
- Ethnicity
- Skin Color

- Marital Status
- Children
- Highest Educational Level
- Employment status
- Occupation
- Annual Personal Income
- Annual Household Income

## 4.2 Decision Tools & Choice Sets

### 4.2.1 Decision Tools Specifications

#### 4.2.1.1 Non-compensatory Decision Tool Specification

1. Non-compensatory tool constitutes a decision aid supporting the choice of an item – health insurance plan, by presenting the options as a list pre-sorted by descending or ascending price (premium). The top leftmost side of the page (above the list) shows a message that reads: 'Please browse through the following options and choose the health insurance plan that you would like to purchase. Hover the mouse over the benefit to read its explanation. Click the arrow on the bottom of the page to confirm your choice.'
2. Each row of the list includes basic information pertaining to a particular health plan (name of plan, premium, and benefits covered).
3. When the user hovers the mouse over a benefit, a pop-up window displays an explanation of that particular benefit.
4. The leftmost side of each row contains a button enabling the user to select the plan.

5. To confirm their choice, the user clicks an arrow on the bottom of the screen. Afterwards, the user is transferred to a follow-up page which provides information on which plan the user has chosen and asks the question whether the user confirms they would like to purchase this plan or whether they would like to go back and choose a different plan.

#### 4.2.1.1.1 Use Case Scenario Non-compensatory Tool

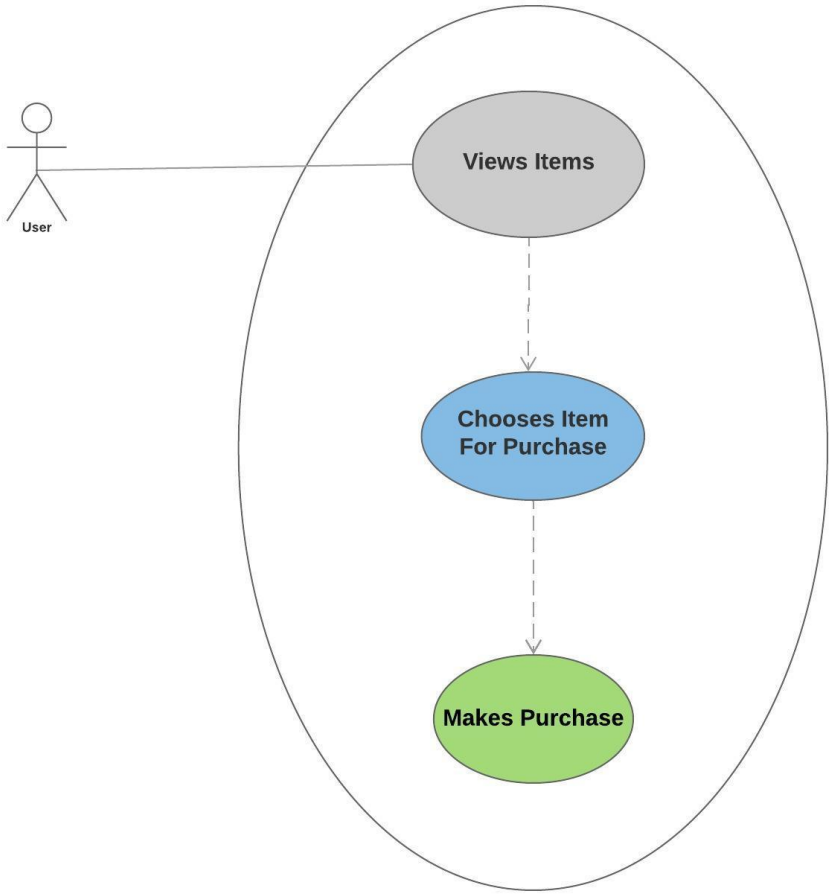



Figure 9 Use case diagram for the Non-compensatory decision tool.

#### 4.2.1.1.1 Flowchart Non-compensatory Tool

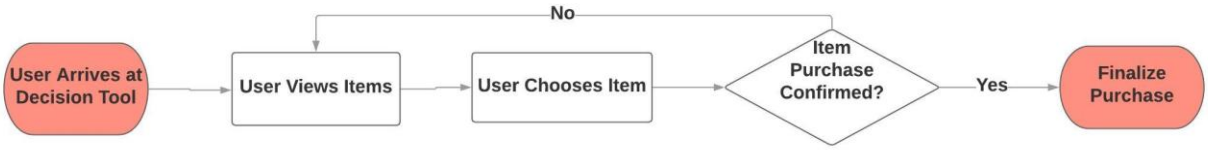



Figure 10 Flowchart of the Non-compensatory decision tool.

### 4.2.1.2 Financial Tool Specification

1. Financial tool constitutes a decision aid supporting the customization of an item – health insurance plan – based on provided attributes. The tool presents the attributes - coverage benefits - as packages that the user can include in their customized plan, as a list. The top leftmost side of the page (above the list) shows a message that reads: 'Please consider below available packages of benefits. Tick the benefit packages which you would like to include in your customized health insurance plan. Hover the mouse over each benefit to read its explanation. Click the arrow on the bottom of the page to confirm your choice.'
2. The list consists of two columns where a row in each column (a cell) corresponds to information on a specific benefits package. Each cell presents the name of the benefits package, price per month, and which benefit or benefits the package includes. To the left of the cell, a button to choose the benefits package is provided.
3. The benefits packages are provided starting from Basic Package and gradually increasing. The ordering of packages and the possible combinations of customized plans (and the number of such combinations) that the user can set up, corresponds to the ordering and choice set in a Non-compensatory tool Ascending.
4. Depending on the ordering of the attribute as well as the limited number of combinations, for certain benefit packages, if the user has picked out a particular

package – or packages (depending on the possible customization combinations) – choosing it/them would automatically open a warning message explaining which other benefit packages must be purchased along the one(s) picked out.

5. When the user hovers the mouse over a benefit, a pop-up window displays an explanation of that particular benefit.
6. To confirm their choice, the user clicks an arrow on the bottom of the screen. Afterwards, the user is transferred to a follow-up page which provides information on which benefit packages the user has chosen and informs them on the total price that user has to incur for the customization. The user is further provided with a question whether they confirm they would like to purchase this plan or whether they would like to go back and choose a different plan. For plans including Prescription Medication and above, the user is also provided with a reminder that there are less costly plans available to customize and what those plans are.

#### 4.2.1.2.1 Use Case Scenario Financial Tool

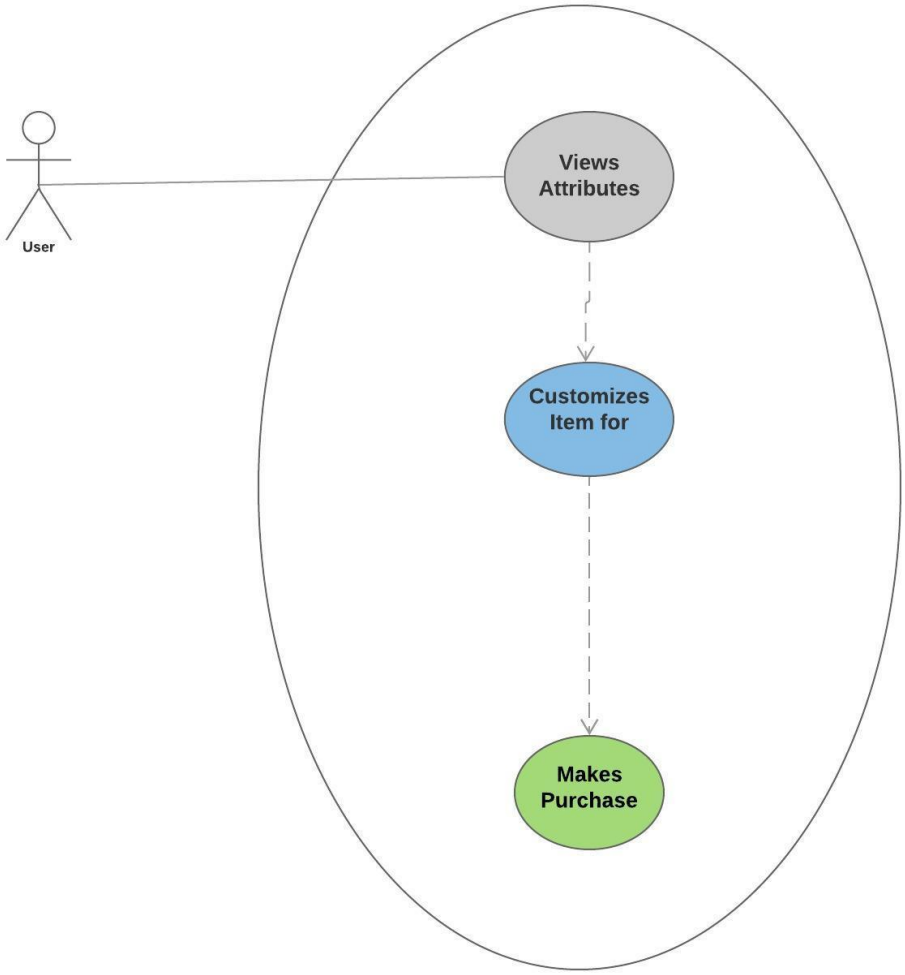



Figure 11 Use case diagram for the Financial decision tool.

#### 4.2.1.2.2 Flowchart Financial Tool

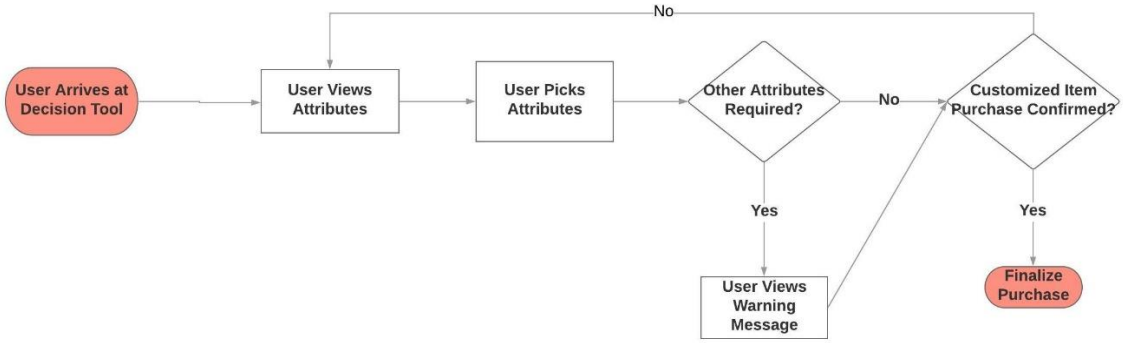



Figure 12 Flowchart of Financial decision tool.

## Choice Sets

### Study 1

The choice sets for Study 1 are presented in Tables 2-4 below.

#### Non-compensatory Descending High-Price Anchor

Choice set adopted to study the effect of non-compensatory descending tool with high price anchor includes 7 alternatives. The number of options of 6-7 in study 1 is chosen as the optimal number of options that would not cause information overload.

| PLAN & PREMIUM (per month) | COVERAGE BENEFITS | | |
|---|---|---|---|
| **Plan GOLDEN PLUS $ 449 per month** | BASIC BENEFITS | CANCER TREATMENT | SKIN CANCER BENEFITS |
| | • Emergency Services<br>• Outpatient Care<br>• Inpatient Care<br>• Laboratory Services<br>• Prescription Medication | •Cancer Treatment - ALL CANCERS INCLUDING SKIN CANCER (both Outpatient and Inpatient basis) | • Skin Cancer Integrative Care Services (Chinese Medicine, Acupuncture, Massage, Yoga)<br>• Supplements for Skin Cancer Patients<br>• Nutritional Counseling and Support for Skin Cancer Patients<br>• 24/7 Telecare for Skin Cancer Patients<br>• Counseling/Therapy (Individual and Relationship) for Skin Cancer Patients<br>• Cosmetic Items (e.g. wigs) and Services (e.g. scar removal) for Skin Cancer Patients<br>• In-Home Care for Skin Cancer Patients<br>• Everyday Living Expenses for Skin Cancer Patients – Mortgage/Rent & Car Payments<br>• Everyday Living Expenses for Skin Cancer Patients – Utilities & Groceries<br>• Travel Expenses for Skin Cancer Patients<br>• Travel Expenses for Caregivers of Skin Cancer Patients<br>• Accounting Services for Skin Cancer Patients<br>• Hospice Care at a Hospice Agency for Skin Cancer Patients<br>• Legal Fees - Writing & Executing a Will for Skin Cancer Patients |

<table>
<tr><td></td><td></td><td></td><td>• Funeral Expenses of Deceased Skin Cancer Patients<br><u>ADDITIONAL FOR THIS PLAN:</u><br>• Grief Counseling and Bereavement Support for Caregivers of Skin Cancer Patients</td></tr>
<tr><td rowspan="3">Plan GOLDEN $ 239 per month</td><td colspan="3">Covers all skin cancer benefits except for Grief Counseling & Bereavement Support</td></tr>
<tr><td>BASIC BENEFITS</td><td>CANCER TREATMENT</td><td>SKIN CANCER BENEFITS</td></tr>
<tr><td>• Emergency Services<br>• Outpatient Care<br>• Inpatient Care<br>• Laboratory Services<br>•Prescription Medication</td><td>• Cancer Treatment - ALL CANCERS INCLUDING SKIN CANCER (both Outpatient and Inpatient basis)</td><td>• Skin Cancer Integrative Care Services (Chinese Medicine, Acupuncture, Massage, Yoga)<br>• Supplements for Skin Cancer Patients<br>• Nutritional Counseling and Support for Skin Cancer Patients<br>• 24/7 Telecare for Skin Cancer Patients<br>• Counseling/Therapy (Individual and Relationship) for Skin Cancer Patients<br>• Cosmetic Items (e.g. wigs) and Services (e.g. scar removal) for Skin Cancer Patients<br>• In-Home Care for Skin Cancer Patients<br>• Everyday Living Expenses for Skin Cancer Patients – Mortgage/Rent & Car Payments<br>• Everyday Living Expenses for Skin Cancer Patients – Utilities & Groceries<br>• Travel Expenses for Skin Cancer Patients<br>• Travel Expenses for Caregivers of Skin Cancer Patients<br>• Accounting Services for Skin Cancer Patients<br>• Hospice Care at a Hospice Agency for Skin Cancer Patients<br>• Legal Fees - Writing & Executing a Will for Skin Cancer Patients</td></tr>
</table>

| | | | |
|---|---|---|---|
| | | | • Funeral Expenses of Deceased Skin Cancer Patients |
| **Plan SILVER $ 185 per month** | BASIC BENEFITS | CANCER TREATMENT | |
| | • Emergency Services<br>• Outpatient Care<br>• Inpatient Care<br>• Laboratory Services<br>• Prescription Medication | Cancer Treatment ALL CANCERS INCLUDING SKIN CANCER (both Outpatient and Inpatient basis) | |
| **Plan BRONZE PLUS II $ 132.5 per month** | BASIC BENEFITS | CANCER TREATMENT | |
| | • Emergency Services<br>• Outpatient Care<br>• Inpatient Care<br>• Laboratory Services | Cancer Treatment - ONLY SKIN CANCER (both Outpatient and Inpatient basis) | |

| | | |
|---|---|---|
| | • Prescription Medication | |
| **Plan BRONZE PLUS I $ 132.5 per month** | BASIC BENEFITS | CANCER TREATMENT |
| | • Emergency Services<br>• Outpatient Care<br>• Inpatient Care<br>• Laboratory Services<br>• Prescription Medication | Cancer Treatment - ANY OTHER THAN SKIN CANCER (both Outpatient and Inpatient basis) |
| **Plan BRONZE $ 80 per month** | BASIC BENEFITS | |
| | • Emergency Services<br>• Outpatient Care (does not cover cancer treatment)<br>• Inpatient Care (does not cover cancer treatment)<br>• Laboratory Services<br>• Prescription Medication | |
| **Plan BRONZE $ 59 per month** | BASIC BENEFITS | |
| | • Emergency Services<br>• Outpatient Care (does not cover cancer treatment)<br>• Inpatient Care (does not cover cancer treatment)<br>• Laboratory Services | |

*Table 2 Choice set for NC Descending with High Price Anchor tool.*

Non-compensatory Descending Low-Price Anchor
Choice set adopted to study the effect of non-compensatory descending tool with low price anchor includes 7 alternatives.

| PLAN & PREMIUM (per month) | COVERAGE BENEFITS | | |
|---|---|---|---|
| **Plan GOLDEN PLUS $ 240 per month** | BASIC BENEFITS | CANCER TREATMENT | SKIN CANCER BENEFITS |
| | • Emergency Services<br>• Outpatient Care<br>• Inpatient Care<br>• Laboratory Services<br>• Prescription Medication | • Cancer Treatment - ALL CANCERS INCLUDING SKIN CANCER (both Outpatient and Inpatient basis) | • Skin Cancer Integrative Care Services (Chinese Medicine, Acupuncture, Massage, Yoga)<br>• Supplements for Skin Cancer Patients<br>• Nutritional Counseling and Support for Skin Cancer Patients<br>• 24/7 Telecare for Skin Cancer Patients<br>• Counseling/Therapy (Individual and Relationship) for Skin Cancer Patients<br>• Cosmetic Items (e.g. wigs) and Services (e.g. scar removal) for Skin Cancer Patients<br>• In-Home Care for Skin Cancer Patients<br>• Everyday Living Expenses for Skin Cancer Patients – Mortgage/Rent & Car Payments<br>• Everyday Living Expenses for Skin Cancer Patients – Utilities & Groceries<br>• Travel Expenses for Skin Cancer Patients<br>• Travel Expenses for Caregivers of Skin Cancer Patients<br>• Accounting Services for Skin Cancer Patients<br>• Hospice Care at a Hospice Agency for Skin Cancer Patients<br>• Legal Fees - Writing & Executing a Will for Skin Cancer Patients<br>• Funeral Expenses of Deceased Skin Cancer Patients<br>**ADDITIONAL FOR THIS PLAN:** |

| | | | |
|---|---|---|---|
| | | | • Grief Counseling and Bereavement Support for Caregivers of Skin Cancer Patients |
| **Plan GOLDEN $ 239 per month** | **Covers all skin cancer benefits except for Grief Counseling & Bereavement Support** | | |
| | BASIC BENEFITS | CANCER TREATMENT | SKIN CANCER BENEFITS |
| | • Emergency Services<br>• Outpatient Care<br>• Inpatient Care<br>• Laboratory Services<br>•Prescription Medication | • Cancer Treatment - ALL CANCERS INCLUDING SKIN CANCER (both Outpatient and Inpatient basis) | • Skin Cancer Integrative Care Services (Chinese Medicine, Acupuncture, Massage, Yoga)<br>• Supplements for Skin Cancer Patients<br>• Nutritional Counseling and Support for Skin Cancer Patients<br>• 24/7 Telecare for Skin Cancer Patients<br>• Counseling/Therapy (Individual and Relationship) for Skin Cancer Patients<br>• Cosmetic Items (e.g. wigs) and Services (e.g. scar removal) for Skin Cancer Patients<br>• In-Home Care for Skin Cancer Patients<br>• Everyday Living Expenses for Skin Cancer Patients – Mortgage/Rent & Car Payments<br>• Everyday Living Expenses for Skin Cancer Patients – Utilities & Groceries<br>• Travel Expenses for Skin Cancer Patients<br>• Travel Expenses for Caregivers of Skin Cancer Patients<br>• Accounting Services for Skin Cancer Patients<br>• Hospice Care at a Hospice Agency for Skin Cancer Patients<br>• Legal Fees - Writing & Executing a Will for Skin Cancer Patients<br>• Funeral Expenses of Deceased Skin Cancer Patients |
| | BASIC BENEFITS | CANCER TREATMENT | |

| | | |
|---|---|---|
| **Plan SILVER $ 185 per month** | | |
| | • Emergency Services<br>• Outpatient Care<br>• Inpatient Care<br>• Laboratory Services<br>• Prescription Medication | Cancer Treatment ALL CANCERS INCLUDING SKIN CANCER (both Outpatient and Inpatient basis) |
| **Plan BRONZE PLUS II $ 132.5 per month** | BASIC BENEFITS | CANCER TREATMENT |
| | • Emergency Services<br>• Outpatient Care<br>• Inpatient Care<br>• Laboratory Services<br>• Prescription Medication | Cancer Treatment - ONLY SKIN CANCER (both Outpatient and Inpatient basis) |
| **Plan BRONZE PLUS I $ 132.5 per month** | BASIC BENEFITS | CANCER TREATMENT |
| | • Emergency Services<br>• Outpatient Care<br>• Inpatient Care<br>• Laboratory Services<br>• Prescription Medication | Cancer Treatment - ANY OTHER THAN SKIN CANCER (both Outpatient and Inpatient basis) |
| **Plan BRONZE $ 80 per month** | BASIC BENEFITS | |
| | • Emergency Services<br>• Outpatient Care (does not cover cancer treatment) | |

| | |
|---|---|
| | • Inpatient Care (does not cover cancer treatment)<br>• Laboratory Services<br>• Prescription Medication |
| **Plan BRONZE $ 59 per month** | BASIC BENEFITS |
| | • Emergency Services<br>• Outpatient Care (does not cover cancer treatment)<br>• Inpatient Care (does not cover cancer treatment)<br>• Laboratory Services |

*Table 3 Choice set for NC Descending with Low Price Anchor.*

Non-compensatory Descending No Anchor

Choice set adopted to study the effect of non-compensatory descending tool with no anchor includes 6 alternatives.

| PLAN & PREMIUM (per month) | COVERAGE BENEFITS | | |
|---|---|---|---|
| **Plan GOLDEN $ 239 per month** | BASIC BENEFITS | CANCER TREATMENT | SKIN CANCER BENEFITS |
| | • Emergency Services<br>• Outpatient Care<br>• Inpatient Care<br>• Laboratory Services | • Cancer Treatment - ALL CANCERS INCLUDING SKIN CANCER (both Outpatient and Inpatient basis) | • Skin Cancer Integrative Care Services (Chinese Medicine, Acupuncture, Massage, Yoga)<br>• Supplements for Skin Cancer Patients<br>• Nutritional Counseling and Support for Skin Cancer Patients<br>• 24/7 Telecare for Skin Cancer Patients |

| | | | |
|---|---|---|---|
| | •Prescription Medication | | • Counseling/Therapy (Individual and Relationship) for Skin Cancer Patients<br>• Cosmetic Items (e.g. wigs) and Services (e.g. scar removal) for Skin Cancer Patients<br>• In-Home Care for Skin Cancer Patients<br>• Everyday Living Expenses for Skin Cancer Patients – Mortgage/Rent & Car Payments<br>• Everyday Living Expenses for Skin Cancer Patients – Utilities & Groceries<br>• Travel Expenses for Skin Cancer Patients<br>• Travel Expenses for Caregivers of Skin Cancer Patients<br>• Accounting Services for Skin Cancer Patients<br>• Hospice Care at a Hospice Agency for Skin Cancer Patients<br>• Legal Fees - Writing & Executing a Will for Skin Cancer Patients<br>• Funeral Expenses of Deceased Skin Cancer Patients |
| **Plan SILVER $ 185 per month** | BASIC BENEFITS | CANCER TREATMENT | |
| | • Emergency Services<br>• Outpatient Care<br>• Inpatient Care<br>• Laboratory Services<br>• Prescription Medication | Cancer Treatment ALL CANCERS INCLUDING SKIN CANCER (both Outpatient and Inpatient basis) | |
| **Plan BRONZE PLUS II** | BASIC BENEFITS | CANCER TREATMENT | |
| | • Emergency Services<br>• Outpatient Care | Cancer Treatment - ONLY SKIN CANCER (both Outpatient and Inpatient basis) | |

| | | |
|---|---|---|
| **$ 132.5 per month** | • Inpatient Care<br>• Laboratory Services<br>• Prescription Medication | |
| **Plan BRONZE PLUS I $ 132.5 per month** | BASIC BENEFITS | CANCER TREATMENT |
| | • Emergency Services<br>• Outpatient Care<br>• Inpatient Care<br>• Laboratory Services<br>• Prescription Medication | Cancer Treatment - ANY OTHER THAN SKIN CANCER (both Outpatient and Inpatient basis) |
| **Plan BRONZE $ 80 per month** | BASIC BENEFITS | |
| | • Emergency Services<br>• Outpatient Care (does not cover cancer treatment)<br>• Inpatient Care (does not cover cancer treatment)<br>• Laboratory Services<br>• Prescription Medication | |
| **Plan BRONZE $ 59 per month** | BASIC BENEFITS | |
| | • Emergency Services<br>• Outpatient Care (does not cover cancer treatment)<br>• Inpatient Care (does not cover cancer treatment)<br>• Laboratory Services | |

*Table 4 Choice set for NC Descending with No Anchor.*

Study 1 Explanation of Benefits

(Exemplary benefits for Golden Plus plan and, further, two specific cancer treatment benefits)

- Emergency Services

Use of emergency room: ambulance transfer and medical aid in a hospital or emergency room in acute and urgent situations; life or limb-threatening emergencies.

- Outpatient Care (does not cover cancer treatment)

Visiting a medical facility and NOT staying overnight for examination, diagnosis, monitoring, and/or treatment. COVERS ALL ILLNESSES AND CANCERS - EXCEPT FOR CANCERS.

- Inpatient Care (does not cover cancer treatment)

Covers any in-hospital care (when patient stays overnight at the hospital), nursing, room, meals, medication and supplies. Involves staying overnight. COVERS ALL ILLNESSES AND CANCERS - EXCEPT FOR CANCERS.

- Laboratory Services

Covers screening and diagnostic laboratory tests when your physician orders them. Laboratory tests include blood tests, urine tests, and tests on tissue specimens.

- Prescription Medication

Covers the cost of prescription drugs and medications as prescribed by your physician.

- Cancer Treatment - ANY OTHER THAN SKIN CANCER (both Outpatient and Inpatient basis)

Treatment of ANY CANCER OTHER THAN SKIN CANCER. Covers any needed therapy: radiation, chemotherapy, immunotherapy, surgery, targeted therapy. Covers both outpatient and inpatient care.

- Cancer Treatment - ONLY SKIN CANCER (both Outpatient and Inpatient basis)

Treatment of SKIN CANCERS ONLY. Covers any needed therapy: radiation, chemotherapy, immunotherapy, surgery, targeted therapy. Covers both outpatient and inpatient care.

- Cancer Treatment ALL CANCERS INCLUDING SKIN CANCER (both Outpatient and Inpatient basis)

Treatment of ALL CANCERS INCLUDING SKIN CANCERS. Covers any needed therapy: radiation, chemotherapy, immunotherapy, surgery, targeted therapy. Covers both outpatient and inpatient care.

- Skin Cancer Integrative Care Services (Chinese Medicine, Acupuncture, Massage, Yoga)

Covers complementary therapies to be combined with conventional medical treatment to help fight the symptoms and side effects of skin cancer treatment. Includes traditional Chinese medicine, acupuncture, massage therapy and yoga. Only for skin cancer patients.

- Supplements for Skin Cancer Patients

Covers the cost of over-the-counter medicines and supplements for skin cancer patients.

- Nutritional Counseling and Support for Skin Cancer Patients

Nutrition therapy services, including assessment and follow-up appointments to support healthy diet management for skin cancer patients.

- 24/7 Telecare for Skin Cancer Patients

Covers the cost of 24/7 remote care with a physician or nurse provided via telephone or videoconferencing for skin cancer patients. Care includes medical consultation, advice, and referrals.

- Counseling/Therapy (Individual and Relationship) for Skin Cancer Patients

Covers the cost of mental health services, and appointments with a psychiatrist, clinical psychologist, or a counsellor for individual therapy for skin cancer patients, or relationship counselling for skin cancer patients and their partners.

- Cosmetic Items (e.g. wigs) and Services (e.g. scar removal) for Skin Cancer Patients

Covers the cost of cosmetic items (e.g. wigs) and services (e.g. reconstructive procedures, scar removal) for skin cancer patients.">Cosmetic Items (e.g. wigs) and Services (e.g. scar removal) for Skin Cancer Patients.

- In-Home Care for Skin Cancer Patients

Covers the cost of home health services, including intermittent nursing care, personal care and homemaker services. Only for skin cancer patients.

- Everyday Living Expenses for Skin Cancer Patients – Mortgage/Rent & Car Payments

Covers the cost of mortgage or rent, and car payments for the duration of skin cancer treatment. Only for skin cancer patients.

- Everyday Living Expenses for Skin Cancer Patients – Utilities & Groceries

Covers the cost of utilities (electricity, natural gas heating, water, sewage, garbage disposal) for the duration of skin cancer treatment. Only for skin cancer patients.

- Travel Expenses for Skin Cancer Patients

Covers travel costs of skin cancer patients. Includes costs of land and/ or air (economy or coach fares) transport when moving temporarily out of town for skin cancer treatment, standard accommodation – furnished room with a bathroom (if undergoing outpatient treatment), and meals when undergoing necessary skin cancer treatment in out-of-town medical facilities.

- Travel Expenses for Caregivers of Skin Cancer Patients

Covers travel costs of 1 caregiver of a skin cancer patient. Includes costs of land and/ or air (economy or coach fares) transport when moving temporarily out of town for skin cancer treatment, standard accommodation – furnished room with a bathroom (if undergoing outpatient treatment), and meals when undergoing necessary skin cancer treatment in out-of-town medical facilities.

- Accounting Services for Skin Cancer Patients

Covers the cost of accounting services (one per year) for skin cancer patients.

- Hospice Care at a Hospice Agency for Skin Cancer Patients

Covers hospice services if patient's physician confirms the illness is terminal and patient has given up treatment. Serves patient's well-being and dignified end of life but does not treat the illness. Includes: room and board, physician and nursing care, and medication for symptom control or pain relief. Only for skin cancer patients.

- Legal Fees - Writing & Executing a Will for Skin Cancer Patients

Covers the cost of legal counseling and support in writing and executing a will of a skin cancer patient.

- Funeral Expenses of Deceased Skin Cancer Patients

Covers funeral costs of a deceased skin cancer patient.

- Grief Counseling and Bereavement Support for Caregivers of Skin Cancer Patients

Covers costs of post-death grief therapy for family members of a deceased skin cancer patient. No restrictions in terms of facilities. Covers bereavement assessment, plan of care, and counseling (until deemed by therapist as necessary).

Study 2

The choice sets for Study 2 are presented in Tables 5-7.

Non-compensatory Descending

Choice set adopted to study the effect of non-compensatory descending tool includes 10 alternatives. The number of options of 10 in study 2 is chosen as not to cause information overload and as the standard number of options generated by an online non-compensatory tool on a single page is 10.

| PLAN & PREMIUM (per month) | COVERAGE BENEFITS | | |
|---|---|---|---|
| **Plan GOLDEN PLUS IV Premium: $ 335 per month** | BASIC BENEFITS | CANCER TREATMENT | SKIN CANCER BENEFITS |
| | • Emergency Services<br>• Outpatient Care<br>• Inpatient Care<br>• Laboratory Services<br>• Prescription Medication | • Cancer Treatment - ALL CANCERS INCLUDING SKIN CANCER (both Outpatient and Inpatient basis) | • Integrative Care Services up to $ 25,000<br>• Supplements up to $ 25,000<br>• Nutritional Counseling and Support up to 5 consultations per month<br>• Telecare up to 5 consultations per month<br>• Counseling/Therapy (Individual and Relationship) up to 5 consultations per month<br>• Cosmetic Items (e.g. wigs) and Services (e.g. scar removal) up to $ 25,000<br>• In-Home Care up to 7x per week<br>• Travel Expenses up to $ 25,000<br>• Hospice Care at a Hospice Agency up to $ 25,000<br>• Funeral Expenses of Deceased Skin Cancer Patients up to $ 25,000 |
| **Plan GOLDEN PLUS III Premium: $ 305 per month** | BASIC BENEFITS | CANCER TREATMENT | SKIN CANCER BENEFITS |
| | • Emergency Services<br>• Outpatient Care<br>• Inpatient Care<br>• Laboratory Services | • Cancer Treatment - ALL CANCERS INCLUDING SKIN CANCER (both Outpatient and Inpatient basis) | • Integrative Care Services up to $ 20,000<br>• Supplements up to $ 20,000<br>• Nutritional Counseling and Support up to 4 consultations per month<br>• Telecare up to 4 consultations per month |

| | | | |
|---|---|---|---|
| | • Prescription Medication | | • Counseling/Therapy (Individual and Relationship) up to 4 consultations per month<br>• Cosmetic Items (e.g. wigs) and Services (e.g. scar removal) up to $ 20,000<br>• In-Home Care up to 6x per week<br>• Travel Expenses up to $ 20,000<br>• Hospice Care at a Hospice Agency up to $ 20,000<br>• Funeral Expenses of Deceased Skin Cancer Patients up to $ 20,000 |
| **Plan GOLDEN PLUS II Premium: $ 275 per month** | BASIC BENEFITS | CANCER TREATMENT | SKIN CANCER BENEFITS |
| | • Emergency Services<br>• Outpatient Care<br>• Inpatient Care<br>• Laboratory Services<br>• Prescription Medication | • Cancer Treatment - ALL CANCERS INCLUDING SKIN CANCER (both Outpatient and Inpatient basis) | • Integrative Care Services up to $ 15,000<br>• Supplements up to $ 15,000<br>• Nutritional Counseling and Support up to 3 consultations per month<br>• Telecare up to 3 consultations per month<br>• Counseling/Therapy (Individual and Relationship) up to 3 consultations per month<br>• Cosmetic Items (e.g. wigs) and Services (e.g. scar removal) up to $ 15,000<br>• In-Home Care up to 5x per week<br>• Travel Expenses up to $ 15,000<br>• Hospice Care at a Hospice Agency up to $ 15,000<br>• Funeral Expenses of Deceased Skin Cancer Patients up to $ 15,000 |
| | BASIC BENEFITS | CANCER TREATMENT | SKIN CANCER BENEFITS |

| | | | |
|---|---|---|---|
| **Plan GOLDEN PLUS I Premium: $ 245 per month** | • Emergency Services<br>• Outpatient Care<br>• Inpatient Care<br>• Laboratory Services<br>• Prescription Medication | • Cancer Treatment - ALL CANCERS INCLUDING SKIN CANCER (both Outpatient and Inpatient basis) | •Integrative Care Services up to $ 10,000<br>•Supplements up to $ 10,000<br>• Nutritional Counseling and Support up to 2 consultations per month<br>•Telecare up to 2 consultations per month<br>•Counseling/Therapy (Individual and Relationship) up to 2 consultations per month<br>•Cosmetic Items (e.g. wigs) and Services (e.g. scar removal) up to $ 10,000<br>•In-Home Care up to 4x per week<br>•Travel Expenses up to $ 10,000<br>•Hospice Care at a Hospice Agency up to $ 10,000<br>•Funeral Expenses of Deceased Skin Cancer Patients up to $ 10,000 |
| **Plan GOLDEN Premium:** | BASIC BENEFITS | CANCER TREATMENT | SKIN CANCER BENEFITS |

| | | | |
|---|---|---|---|
| **$ 215 per month** | • Emergency Services<br>• Outpatient Care<br>• Inpatient Care<br>• Laboratory Services<br>•Prescription Medication | • Cancer Treatment - ALL CANCERS INCLUDING SKIN CANCER (both Outpatient and Inpatient basis) | • Integrative Care Services up to $ 5,000<br>• Supplements up to $ 5,000<br>• Nutritional Counseling and Support up to 1 consultation per month<br>• Telecare up to 1 consultation per month<br>• Counseling/Therapy (Individual and Relationship) up to 1 consultation per month<br>• Cosmetic Items (e.g. wigs) and Services (e.g. scar removal) up to $ 5,000<br>• In-Home Care up to 3x per week<br>• Travel Expenses up to $ 5,000<br>• Hospice Care at a Hospice Agency up to $ 5,000<br>• Funeral Expenses of Deceased Skin Cancer Patients up to $ 5,000 |
| **Plan SILVER $ 185 per month** | BASIC BENEFITS | CANCER TREATMENT | |
| | • Emergency Services<br>• Outpatient Care<br>• Inpatient Care<br>• Laboratory Services<br>• Prescription Medication | Cancer Treatment ALL CANCERS INCLUDING SKIN CANCER (both Outpatient and Inpatient basis) | |
| **Plan BRONZE PLUS II $ 132.5 per month** | BASIC BENEFITS | CANCER TREATMENT | |
| | • Emergency Services<br>• Outpatient Care<br>• Inpatient Care<br>• Laboratory Services | Cancer Treatment - ONLY SKIN CANCER (both Outpatient and Inpatient basis) | |

| | | |
|---|---|---|
| | • Prescription Medication | |
| **Plan BRONZE PLUS I $ 132.5 per month** | BASIC BENEFITS | CANCER TREATMENT |
| | • Emergency Services<br>• Outpatient Care<br>• Inpatient Care<br>• Laboratory Services<br>• Prescription Medication | Cancer Treatment - ANY OTHER THAN SKIN CANCER (both Outpatient and Inpatient basis) |
| **Plan BRONZE $ 80 per month** | BASIC BENEFITS | |
| | • Emergency Services<br>• Outpatient Care (does not cover cancer treatment)<br>• Inpatient Care (does not cover cancer treatment)<br>• Laboratory Services<br>• Prescription Medication | |
| **Plan BRONZE $ 59 per month** | BASIC BENEFITS | |
| | • Emergency Services<br>• Outpatient Care (does not cover cancer treatment)<br>• Inpatient Care (does not cover cancer treatment)<br>• Laboratory Services | |

*Table 5 Choice set for NC Descending.*

Non-compensatory Ascending

Choice set adopted to study the effect of non-compensatory ascending tool includes 10 alternatives.

| PLAN & PREMIUM (per month) | COVERAGE BENEFITS | |
|---|---|---|
| **Plan BRONZE $ 59 per month** | BASIC BENEFITS | |
| | • Emergency Services<br>• Outpatient Care (does not cover cancer treatment)<br>• Inpatient Care (does not cover cancer treatment)<br>• Laboratory Services | |
| **Plan BRONZE $ 80 per month** | BASIC BENEFITS | |
| | • Emergency Services<br>• Outpatient Care (does not cover cancer treatment)<br>• Inpatient Care (does not cover cancer treatment)<br>• Laboratory Services<br>• Prescription Medication | |
| **Plan BRONZE PLUS I $ 132.5 per month** | BASIC BENEFITS | CANCER TREATMENT |
| | • Emergency Services<br>• Outpatient Care<br>• Inpatient Care<br>• Laboratory Services<br>• Prescription Medication | Cancer Treatment - ANY OTHER THAN SKIN CANCER (both Outpatient and Inpatient basis) |
| **Plan BRONZE PLUS II $ 132.5 per month** | BASIC BENEFITS | CANCER TREATMENT |
| | • Emergency Services<br>• Outpatient Care<br>• Inpatient Care<br>• Laboratory Services<br>• Prescription Medication | Cancer Treatment - ONLY SKIN CANCER (both Outpatient and Inpatient basis) |

| | | | |
|---|---|---|---|
| **Plan SILVER $ 185 per month** | BASIC BENEFITS | CANCER TREATMENT | |
| | • Emergency Services<br>• Outpatient Care<br>• Inpatient Care<br>• Laboratory Services<br>• Prescription Medication | Cancer Treatment ALL CANCERS INCLUDING SKIN CANCER (both Outpatient and Inpatient basis) | |
| **Plan GOLDEN Premium: $ 215 per month** | BASIC BENEFITS | CANCER TREATMENT | SKIN CANCER BENEFITS |
| | • Emergency Services<br>• Outpatient Care<br>• Inpatient Care<br>• Laboratory Services<br>•Prescription Medication | • Cancer Treatment - ALL CANCERS INCLUDING SKIN CANCER (both Outpatient and Inpatient basis) | • Integrative Care Services up to $ 5,000<br>• Supplements up to $ 5,000<br>• Nutritional Counseling and Support up to 1 consultation per month<br>• Telecare up to 1 consultation per month<br>• Counseling/Therapy (Individual and Relationship) up to 1 consultation per month<br>• Cosmetic Items (e.g. wigs) and Services (e.g. scar removal) up to $ 5,000<br>• In-Home Care up to 3x per week<br>• Travel Expenses up to $ 5,000<br>• Hospice Care at a Hospice Agency up to $ 5,000<br>• Funeral Expenses of Deceased Skin Cancer Patients up to $ 5,000 |
| **Plan GOLDEN PLUS I** | BASIC BENEFITS | CANCER TREATMENT | SKIN CANCER BENEFITS |

| | | | |
|---|---|---|---|
| **Premium: $ 245 per month** | • Emergency Services<br>• Outpatient Care<br>• Inpatient Care<br>• Laboratory Services<br>• Prescription Medication | • Cancer Treatment - ALL CANCERS INCLUDING SKIN CANCER (both Outpatient and Inpatient basis) | •Integrative Care Services up to $ 10,000<br>•Supplements up to $ 10,000<br>• Nutritional Counseling and Support up to 2 consultations per month<br>•Telecare up to 2 consultations per month<br>Counseling/Therapy (Individual and Relationship) up to 2 consultations per month<br>•Cosmetic Items (e.g. wigs) and Services (e.g. scar removal) up to $ 10,000<br>•In-Home Care up to 4x per week<br>•Travel Expenses up to $ 10,000<br>•Hospice Care at a Hospice Agency up to $ 10,000<br>•Funeral Expenses of Deceased Skin Cancer Patients up to $ 10,000 |
| **Plan GOLDEN PLUS II Premium: $ 275 per month** | BASIC BENEFITS | CANCER TREATMENT | SKIN CANCER BENEFITS |
| | • Emergency Services<br>• Outpatient Care<br>• Inpatient Care<br>• Laboratory Services<br>• Prescription Medication | • Cancer Treatment - ALL CANCERS INCLUDING SKIN CANCER (both Outpatient and Inpatient basis) | • Integrative Care Services up to $ 15,000<br>• Supplements up to $ 15,000<br>• Nutritional Counseling and Support up to 3 consultations per month<br>• Telecare up to 3 consultations per month<br>• Counseling/Therapy (Individual and Relationship) up to 3 consultations per month<br>• Cosmetic Items (e.g. wigs) and Services (e.g. scar removal) up to $ 15,000<br>• In-Home Care up to 5x per week<br>• Travel Expenses up to $ 15,000 |

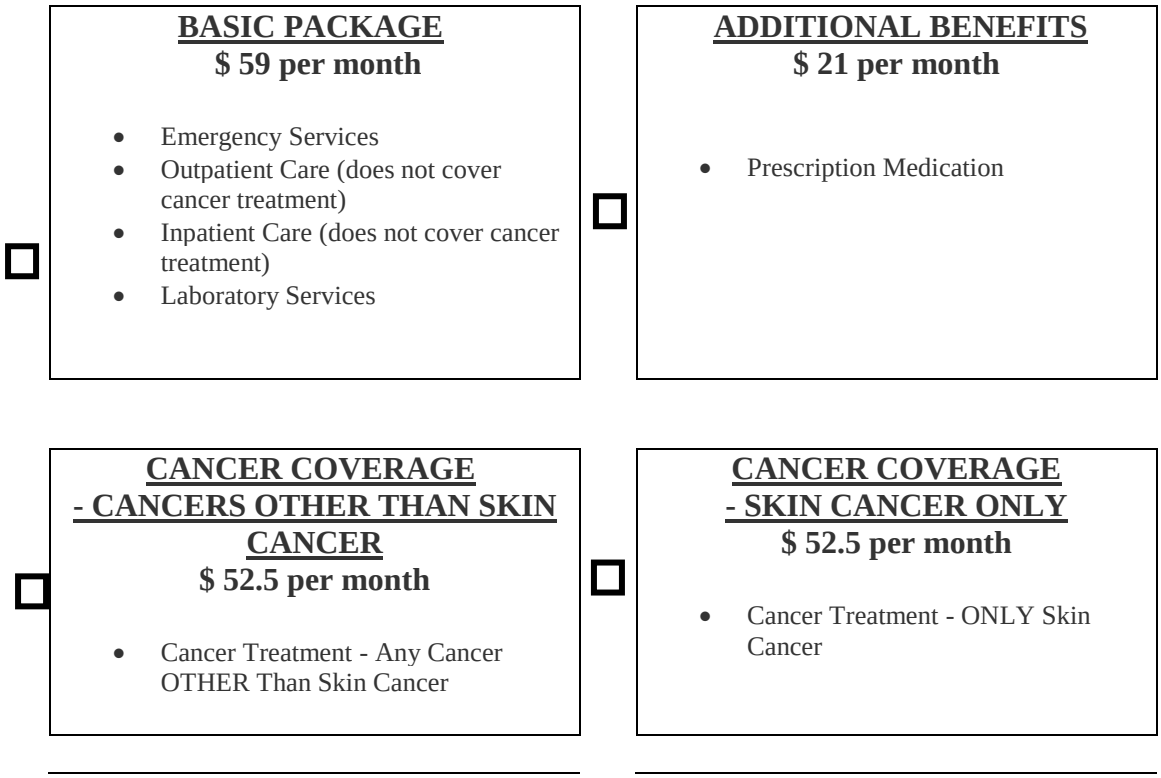
| | | | |
|---|---|---|---|
| | | | • Hospice Care at a Hospice Agency up to $ 15,000<br>• Funeral Expenses of Deceased Skin Cancer Patients up to $ 15,000 |
| **Plan GOLDEN PLUS III Premium: $ 305 per month** | BASIC BENEFITS | CANCER TREATMENT | SKIN CANCER BENEFITS |
| | • Emergency Services<br>• Outpatient Care<br>• Inpatient Care<br>• Laboratory Services<br>• Prescription Medication | • Cancer Treatment - ALL CANCERS INCLUDING SKIN CANCER (both Outpatient and Inpatient basis) | • Integrative Care Services up to $ 20,000<br>• Supplements up to $ 20,000<br>• Nutritional Counseling and Support up to 4 consultations per month<br>• Telecare up to 4 consultations per month<br>• Counseling/Therapy (Individual and Relationship) up to 4 consultations per month<br>• Cosmetic Items (e.g. wigs) and Services (e.g. scar removal) up to $ 20,000<br>• In-Home Care up to 6x per week<br>• Travel Expenses up to $ 20,000<br>• Hospice Care at a Hospice Agency up to $ 20,000<br>• Funeral Expenses of Deceased Skin Cancer Patients up to $ 20,000 |
| **Plan GOLDEN PLUS IV Premium: $ 335 per month** | BASIC BENEFITS | CANCER TREATMENT | SKIN CANCER BENEFITS |
| | • Emergency Services<br>• Outpatient Care<br>• Inpatient Care<br>• Laboratory Services | • Cancer Treatment - ALL CANCERS INCLUDING SKIN CANCER (both Outpatient and Inpatient basis) | • Integrative Care Services up to $ 25,000<br>• Supplements up to $ 25,000<br>• Nutritional Counseling and Support up to 5 consultations per month<br>• Telecare up to 5 consultations per month |

| | | | |
|---|---|---|---|
| | • Prescription Medication | | • Counseling/Therapy (Individual and Relationship) up to 5 consultations per month<br>• Cosmetic Items (e.g. wigs) and Services (e.g. scar removal) up to $ 25,000<br>• In-Home Care up to 7x per week<br>• Travel Expenses up to $ 25,000<br>• Hospice Care at a Hospice Agency up to $ 25,000<br>• Funeral Expenses of Deceased Skin Cancer Patients up to $ 25,000 |

*Table 6 Choice set for NC Ascending.*

Financial

Choice set adopted to study the effect the financial tool includes 9 attribute packages which are possible to be customized into 10 items.



**SKIN CANCER**
**- MISCELLANEOUS**
**$ 30 per month**

**(These benefits are only for Skin Cancer Patients)**

**Expense coverage & services**

- Integrative Care Services up to $ 5,000
- Supplements up to $ 5,000
- Nutritional Counseling and Support up to 1 consultation per month
- Telecare up to 1 consultation per month
- Counseling/Therapy (Individual and Relationship) up to 1 consultation per month
- Cosmetic Items (e.g. wigs) and Services (e.g. scar removal) up to $ 5,000
- In-Home Care up to 3x per week
- Travel Expenses up to $ 5,000
- Hospice Care at a Hospice Agency $ 5,000
- Funeral Expenses of Deceased Skin Cancer Patients $ 5,000

**SKIN CANCER**
**- MISCELLANEOUS**
**$ 30 per month**

**(These benefits are only for Skin Cancer Patients)**

**Additional expense coverage & services**

- Integrative Care Services $ 5,000
- Supplements $ 5,000
- Nutritional Counseling and Support 1 consultation per month
- Telecare 1 consultation per month
- Counseling/Therapy (Individual and Relationship) 1 consultation per month
- Cosmetic Items (e.g. wigs) and Services (e.g. scar removal) $ 5,000
- In-Home Care 1x per week
- Travel Expenses $ 5,000
- Hospice Care at a Hospice Agency $ 5,000
- Funeral Expenses of Deceased Skin Cancer Patients $ 5,000

**SKIN CANCER**
**- MISCELLANEOUS**
**$ 30 per month**

**(These benefits are only for Skin Cancer Patients)**

**Additional expense coverage & services**

- Integrative Care Services $ 5,000
- Supplements $ 5,000
- Nutritional Counseling and Support 1 consultation per month
- Telecare 1 consultation per month
- Counseling/Therapy (Individual and Relationship) 1 consultation per month

**SKIN CANCER**
**- MISCELLANEOUS**
**$ 30 per month**

**(These benefits are only for Skin Cancer Patients)**

**Additional expense coverage & services**

- Integrative Care Services $ 5,000
- Supplements $ 5,000
- Nutritional Counseling and Support 1 consultation per month
- Telecare 1 consultation per month
- Counseling/Therapy (Individual and Relationship) 1 consultation per month

- Cosmetic Items (e.g. wigs) and Services (e.g. scar removal) $ 5,000
- In-Home Care 1x per week
- Travel Expenses $ 5,000
- Hospice Care at a Hospice Agency $ 5,000
- Funeral Expenses of Deceased Skin Cancer Patients $ 5,000

- Cosmetic Items (e.g. wigs) and Services (e.g. scar removal) $ 5,000
- In-Home Care 1x per week
- Travel Expenses $ 5,000
- Hospice Care at a Hospice Agency $ 5,000
- Funeral Expenses of Deceased Skin Cancer Patients $ 5,000

**SKIN CANCER**
**- MISCELLANEOUS**
**$ 30 per month**

**(These benefits are only for Skin Cancer Patients)**

**Additional expense coverage & services**

- Integrative Care Services $ 5,000
- Supplements $ 5,000
- Nutritional Counseling and Support 1 consultation per month
- Telecare 1 consultation per month
- Counseling/Therapy (Individual and Relationship) 1 consultation per month
- Cosmetic Items (e.g. wigs) and Services (e.g. scar removal) $ 5,000
- In-Home Care 1x per week
- Travel Expenses $ 5,000
- Hospice Care at a Hospice Agency $ 5,000
- Funeral Expenses of Deceased Skin Cancer Patients $ 5,000

*Table 7 Choice set and display of attribute packages in Financial tool.*

Study 2 Explanation of Benefits

(Exemplary benefits for Golden Plus IV plan and, further, two specific cancer treatment benefits)

- Emergency Services

Use of emergency room: ambulance transfer and medical aid in a hospital or emergency room in acute and urgent situations; life or limb-threatening emergencies.

- Outpatient Care (does not cover cancer treatment)

Visiting a medical facility and NOT staying overnight for examination, diagnosis, monitoring, and/or treatment. COVERS ALL ILLNESSES EXCEPT FOR CANCERS.

- Inpatient Care (hospitalization and hospital stay; does not cover cancer treatment)

Covers any in-hospital care (when patient stays overnight at the hospital), nursing, room, meals, medication and supplies. Involves staying overnight. COVERS ALL ILLNESSES EXCEPT FOR CANCER.

- Laboratory Services

Covers screening and diagnostic laboratory tests when your physician orders them. Laboratory tests include blood tests, urine tests, and tests on tissue specimens.

- Prescription Medication

Covers the cost of prescription drugs and medications as prescribed by your physician.

- Cancer Treatment - ANY OTHER THAN SKIN CANCER (both Outpatient and Inpatient basis)

Treatment of ANY CANCER OTHER THAN SKIN CANCER. Covers any needed therapy: radiation, chemotherapy, immunotherapy, surgery, targeted therapy. Covers both outpatient and inpatient care.

- Cancer Treatment - ONLY SKIN CANCER (both Outpatient and Inpatient basis)

Treatment of SKIN CANCERS ONLY. Covers any needed therapy: radiation, chemotherapy, immunotherapy, surgery, targeted therapy. Covers both outpatient and inpatient care.

- Cancer Treatment - ALL CANCERS INCLUDING SKIN CANCER (both Outpatient and Inpatient basis)

Treatment of ALL CANCERS INCLUDING SKIN CANCER. Covers any needed therapy: radiation, chemotherapy, immunotherapy, surgery, targeted therapy. Covers both outpatient and inpatient care.

- Skin Cancer Integrative Care Services (Chinese Medicine, Acupuncture, Massage, Yoga)

Covers up to $ 25,000 of bills for complementary therapies to be combined with conventional medical treatment to help fight the symptoms and side effects of skin cancer

treatment. Includes traditional Chinese medicine, acupuncture, massage therapy and yoga. Only for skin cancer patients.

- Supplements (Nonprescription Drugs) for Skin Cancer Patients

Covers up to $ 25,000 of cost of over-the-counter medicines and supplements for skin cancer patients.

- Nutritional Counseling and Support for Skin Cancer Patients

Covers up to 5 consultations per month of nutrition therapy services, including assessment and follow-up appointments to support healthy diet management for skin cancer patients.

- Telecare for Skin Cancer Patients

Covers up to 5 consultations per month of remote care with a physician or nurse provided via telephone or videoconferencing for skin cancer patients. Care includes medical consultation, advice, and referrals.

- Counseling/Therapy (Individual and Relationship) for Skin Cancer Patients

Covers up to 5 consultations per month of mental health services, and appointments with a psychiatrist, clinical psychologist, or a counsellor for individual therapy for skin cancer patients, or relationship counselling for skin cancer patients and their partners.

- Cosmetic Items (e.g. wigs) and Services (e.g. scar removal) for Skin Cancer Patients

Covers up to $ 25,000 of bills for cosmetic items (e.g. wigs) and services (e.g. reconstructive procedures, scar removal) for skin cancer patients.

- In-Home Care for Skin Cancer Patients

Covers up to 7 visits per week (8 hrs each) of home health services, including intermittent nursing care, personal care and homemaker services. Only for skin cancer patients.

- Travel Expenses to Treatment Centers for Skin Cancer Patients (transportation, lodging, meals)

Covers up to $ 25,000 of travel costs of skin cancer patients. Includes costs of land and/ or air (economy or coach fares) transport when moving temporarily out of town for skin cancer treatment, standard accommodation – furnished room with a bathroom (if undergoing outpatient treatment), and meals when undergoing necessary skin cancer treatment in out-of-town medical facilities."

- Hospice Care at a Hospice Agency for Skin Cancer Patients

Covers up to $ 25,000 of bills for hospice services if patient's physician confirms the illness is terminal and patient has given up treatment. Serves patient's well-being and dignified end of life but does not treat the illness. Includes: room and board, physician and nursing care, and medication for symptom control or pain relief. Only for skin cancer patients.

- Funeral Expenses of Deceased Skin Cancer Patients

Covers up to $ 25,000 of funeral costs of a deceased skin cancer patient.">Funeral Expenses of Deceased Skin Cancer Patients up to $ 25,000.

## 4.3 Variables

### 4.3.1 Study 1

#### 4.3.1.1 Variable Measurement

Measures for the variables examined in Study 1 are presented in Tables 8-10.

| VARIABLE | DEFINITION | MEASURE | SCALE | CITATION |
|---|---|---|---|---|
| DECISION-RELATED VARIABLES | | | | |
| • DECISION TOOL-RELATED VARIABLES | | | | |
| Decision Support Tool | Online decision tool supporting the decision process: non-compensatory with three forms of output characteristics | constitutes a list of item alternatives sorted by price in a descending order (Price High – Low) and differentiates among three forms of output characteristics; output including:<br>1) **High Price Anchor –** topmost alternative constitutes an anchor with large price increase and slight utility increase;<br>2) **Low Price Anchor** – topmost alternative constitutes an anchor with slight price increase and slight utility increase;<br>3) **No Anchor** – the choice set does not include the item offered as anchor and the topmost option is equivalent to the second from the top option in the first (with high price anchor) and second (with low price anchor) choice sets | N/A | (Ariely et al., 2003; Kamis et al., 2008; Tan et al., 2010) |
| Decision Quality | User's decision quality when making the choice, i.e. when purchasing the item – health insurance plan; that is, final plan purchase: overspending (plan with higher price and great extent of coverage) vs. not overspending (plan with lower price and | Final plan: $DQ_{negative}$: overspending vs. $DQ_{positive}$: not overspending | Frequency of plan purchase | (Andrew J. Barnes et al., 2016, 2012; W. C. Park et al., 2000) |

| | | | | |
|---|---|---|---|---|
| | lower extent of coverage) | | | |
| • USER'S DECISION-RELATED VARIABLES | | | | |
| Decision Approach | User's approach when evaluating the given alternatives (or item attribute packages) and making the choice of an item (or customizing the item), i.e. health insurance plan; differentiated as: price heuristics-driven (considering the available alternatives in terms of minimization of cost): a) strong vs. b) weak | Please indicate your level of feeling and experience for the following:<br><br>Just now, when I was choosing the health insurance plan…<br><br>• I relied completely on price. – I didn't rely on price at all.<br>• I wasn't concerned about coverage benefits at all. – I was only concerned with coverage benefits.<br>• The coverage benefits didn't matter at all. – The coverage benefits were all that mattered. | Likert 1-7 anchored | (Abaluck & Gruber, 2011; Lichtenstein et al., 1993; Peng, Xia, Fanglin, et al., 2016) |
| RISK BEHAVIOR-RELATED VARIABLES | | | | |
| Perceived Risk | User's subjective assessment of the probability of an | Imagining yourself in the scenario, how likely do you think it would be that you would develop skin cancer? | 1-9<br>Not at all - Extremely Likely | (Kaufman, Bollinger, Dvoskin, & Scott, 2012) |

| | | | | |
|---|---|---|---|---|
| | adverse outcome, that is developing skin cancer, as imagining themselves in the scenario | | | |
| MEASURING | | | | |
| Health Status | User's overall self-rated health status, chronic conditions and current tobacco use | In general, would you say your health is: Poor - Fair - Good - Very Good - Excellent | 5-point Likert | (Andrew J. Barnes et al., 2016; Kuye, Frank, & McWilliams, 2013) |
| | | Do you suffer from any chronic conditions? | Nominal | |
| | | Do you currently smoke cigarettes? | Ordinal | |
| Health Services Utilization | User's expected needs for health care utilization | In the past year, how many inpatient stays or visits to the emergency room have you had? | Ordinal | (Andrew J. Barnes et al., 2016) |
| Prior Experience with Adverse Outcome | User's prior experience of the adverse outcome, i.e. skin cancer: a) individual; b) family-related; and c) friend/ acquaintance - related | Have you ever suffered from skin cancer? | Nominal | (Lang, Giese-Davis, Patton, & Campbell, 2017; Lykins et al., 2008) |
| | | Has anyone in your family ever suffered from skin cancer? | Nominal | |
| | | Have any of your friends or acquaintances ever suffered from skin cancer? | Nominal | |
| Individual Perceived Risk | User's subjective assessment of the probability of an | In your individual life, how likely do you think it would be that you would develop skin cancer? | 1-9 Not at all – Extremely Likely | (Kim, Perez-Stable, & Wong, 2008) |

| | | | | |
|---|---|---|---|---|
| | adverse outcome, that is developing skin cancer and [general] cancer as perceived in their individual life | In your individual life, how likely do you think it would be that you would develop cancer? | 1-9 Not at all – Extremely Likely | |
| Knowledge of Adverse Outcome | User's knowledge of the adverse outcome, i.e. skin cancer: its occurrence, manifestation, risk factors, and possible treatment options | According to you, to what extent does the text about skin cancer that you just read contain new or known information? | 1-7 Anchored Much known information - Much new information | (Mevissen, Meertens, Ruiter, Feenstra, & Schaalma, 2009) |
| | | To what extent did you understand the information presented in the text about skin cancer that you just read? | 1-7 Not at all – Fully | |

*Table 8 Variable measurement for Study 1.*

| PARTICIPANT INVOLVEMENT CHECKS | DEFINITION | MEASURE | SCALE | CITATION |
|---|---|---|---|---|
| Task Involvement | User's involvement and interest in the experimental purchase task | When you were choosing the health insurance plan, to what extent were you:<br>• Involved<br>• Interested<br>• Putting effort | 5-point Likert<br>Not at all – Very<br>Not at all – Very<br>Not at all – A lot | (X. Wang & Keh, 2017) |

| | | | | |
|---|---|---|---|---|
| | | When you were choosing the health insurance plan, to what extent were you making the decision as if you were really making it in real life? | 7-point Likert Not at all - Extremely | |
| | | | | |
| Knowledge of Adverse Outcome control involvement | User's involvement in the control for knowledge of adverse outcome | Which of the following include skin cancer risk factors according to the text that you just read? Tick all that apply.<br><br>☐ Skin inflammation<br>☐ Exposure to certain chemicals<br>☐ Exposure to sunlight and use of tanning beds<br>☐ Family history of skin cancer<br>☐ Xanthinuria Type 1 | Nominal | N/A |
| Perceived Risk manipulation involvement | User's involvement in the manipulation of perceived risk | What was the medical condition that your cousin suffered from in the scenario that you read?<br><br>o stage 4 squamos cell carcinoma<br>o stage 4 melanoma<br>o stage 2 squamos cell carcinoma<br>o none of the above | Nominal | N/A |

| | | | | |
|---|---|---|---|---|
| | | What was the email about – that you were said to have received – in the scenario that you read?<br><br>o Advice on what health plans I should purchase.<br>o Advice on how to prevent skin cancer.<br>o My genetic predisposition for skin cancer.<br>o There was no email mentioned in the scenario. | Nominal | |
| Task Comprehension | User's understanding of experimental task | Did you understand the purchase task you were asked to do?<br><br>(If chose No) What confused you about the task? | Nominal | N/A |

*Table 9 Participant involvement checks for Study 1.*

#### 4.3.1.2 Control Variables

Variables controlled for are summarized in the table below.

| VARIABLE | DEFINITION | MEANS OF CONTROL |
|---|---|---|
| PURCHASE-RELATED FACTORS | | |
| Perceived Credibility | User's perceived credibility of the online store and brand of the item | Experimental design |
| Reputation | Reputation of the online store and brand of the item | Experimental design |

| | | |
|---|---|---|
| Trust | User's trust in the online store and brand of the item) | Experimental design |
| RISK-RELATED VARIABLES | | |
| Family History of Adverse Outcome | Prior occurrence of adverse outcome in user's family | Experimental design |
| Knowledge of Adverse Outcome[9] (not controlled) | User's knowledge of the adverse outcome, i.e. skin cancer: its occurrence, manifestation, risk factors, and possible treatment options | Experimental design |

*Table 10 Control variables in Study 1.*

[9] Upon consultation with 3 FIU PhD students, it was decided to use a combination of time spent & correct answers given to check for Knowledge of Adverse Outcome. The text relating to the basic information on skin cancer was rather detailed, and as one of the PhD students indicated, they wouldn't remember all the information. Analysis showing the results of the role of this variable in the results is indicated in the Appendix.

### 4.3.2 Study 2

#### 4.3.2.1 Variable measurement

Measures for the variables examined in Study 2 are presented below in Tables 11-13.

| VARIABLE | DEFINITION | MEASURE | SCALE | CITATION |
|---|---|---|---|---|
| • DECISION-RELATED VARIABLES | | | | |
| • DECISION TOOL-RELATED VARIABLES | | | | |
| Decision Support Tool | Online decision tool supporting the decision process: non-compensatory and financial | Non-compensatory tool (sorted list of item alternatives): descending price and ascending price<br>Financial tool (list of item attribute packages and enabling customization of the item) | N/A | (Aksoy et al., 2006; Kamis et al., 2008; Suk et al., 2012; Tan et al., 2010) |
| Decision Quality | User's decision quality when making the choice, i.e. when purchasing the item – health insurance plan; that is, final price paid for the plan: overspending vs. not overspending | Final price: $DQ_{negative}$: overspending vs. $DQ_{positive}$: not overspending | Price paid | (Andrew J. Barnes et al., 2016, 2012; W. C. Park et al., 2000) |
| USER'S DECISION-RELATED VARIABLES | | | | |
| Decision Approach | User's approach when evaluating the given alternatives (or item attribute packages) and | Please indicate your level of feeling and experience for the following:<br><br>Just now, when I was choosing the health insurance plan… | Likert 1-7 anchored | (Abaluck & Gruber, 2011; Lichtenstein et al., 1993; Peng, Xia, Ruan, et al., 2016) |

| | | | | |
|---|---|---|---|---|
| | making the choice of an item (or customizing the item), i.e. health insurance plan; differentiated as: price heuristics-driven (considering the available alternatives in terms of minimization of cost): a) strong vs. b) weak | • I relied completely on price. – I didn't rely on price at all.<br>• I wasn't concerned about coverage benefits at all. – I was only concerned with coverage benefits.<br>• The coverage benefits didn't matter at all. – The coverage benefits were all that mattered. | | |
| RISK BEHAVIOR-RELATED VARIABLES | | | | |
| Perceived Risk | User's subjective assessment of the probability of an adverse outcome, that is developing skin cancer, as imagining themselves in the scenario | Imagining yourself in the scenario, how likely do you think it would be that you would develop skin cancer? | 1-9<br>Not at all - Extremely Likely | (Kaufman et al., 2012) |
| MEASURING | | | | |

| | | | | |
|---|---|---|---|---|
| Health Status | User's overall self-rated health status, chronic conditions and current tobacco use | In general, would you say your health is:<br>Poor - Fair - Good - Very Good - Excellent | 5-point Likert | (Andrew J. Barnes et al., 2016; Kuye et al., 2013) |
| | | Do you suffer from any chronic conditions? | Nominal | |
| | | Do you currently smoke cigarettes? | Ordinal | |
| Health Services Utilization | User's expected needs for health care utilization | In the past year, how many inpatient stays or visits to the emergency room have you had? | Ordinal | (Andrew J. Barnes et al., 2016) |
| Prior Experience with Adverse Outcome | User's prior experience of the adverse outcome, i.e. skin cancer: a) individual; b) family-related; and c) friend/ acquaintance - related | Have you ever suffered from skin cancer? | Nominal | (Lang et al., 2017; Lykins et al., 2008) |
| | | Has anyone in your family ever suffered from skin cancer? | Nominal | |
| | | Have any of your friends or acquaintances ever suffered from skin cancer? | Nominal | |

| | | | | |
|---|---|---|---|---|
| Individual Perceived Risk | User's subjective assessment of the probability of an adverse outcome, that is developing skin cancer and [general] cancer as perceived in their individual life | In your individual life, how likely do you think it would be that you would develop skin cancer? | 1-9 Not at all – Extremely Likely | (Kim, Perez-Stable, & Wong, 2008) |
| | | In your individual life, how likely do you think it would be that you would develop cancer? | 1-9 Not at all – Extremely Likely | |
| Knowledge of Adverse Outcome | User's knowledge of the adverse outcome, i.e. skin cancer: its occurrence, manifestation, risk factors, and possible treatment options | According to you, to what extent does the text about skin cancer that you just read contain new or known information? | 1-7 Anchored Much known information - Much new information | (Mevissen et al., 2009) |
| | | To what extent did you understand the information presented in the text about skin cancer that you just read? | 1-7 Not at all – Fully | |

*Table 11 Variable measurement for Study 2.*

| PARTICIPANT INVOLVEMENT CHECKS | DEFINITION | MEASURE | SCALE | CITATION |
|---|---|---|---|---|
| Task Involvement | User's involvement and interest in the experimental purchase task | When you were choosing the health insurance plan, to what extent were you:<br>• Involved<br>• Interested | 5-point Likert<br>Not at all – Very<br>Not at all – Very<br>Not at all – A lot | (X. Wang & Keh, 2017) |

| | | | | |
|---|---|---|---|---|
| | | • Putting effort | | |
| | | When you were choosing the health insurance plan, to what extent were you making the decision as if you were really making it in real life? | 7-point Likert<br>Not at all - Extremely | |
| | | | | |
| Knowledge of Adverse Outcome control involvement | User's involvement in the control for knowledge of adverse outcome | Which of the following include skin cancer risk factors according to the text that you just read? Tick all that apply.<br><br>☐ Skin inflammation<br>☐ Exposure to certain chemicals<br>☐ Exposure to sunlight and use of tanning beds<br>☐ Family history of skin cancer<br>☐ Xanthinuria Type 1 | Nominal | N/A |
| Perceived Risk manipulation involvement | User's involvement in the manipulation of perceived risk | What was the medical condition that your cousin suffered from in the scenario that you read?<br><br>o stage 4 squamos cell carcinoma<br>o stage 4 melanoma<br>o stage 2 squamos cell carcinoma<br>o none of the above | Nominal | N/A |

| | | | | |
|---|---|---|---|---|
| | | What was the email about – that you were said to have received – in the scenario that you read?<br><br>o Advice on what health plans I should purchase.<br>o Advice on how to prevent skin cancer.<br>o My genetic predisposition for skin cancer.<br>o There was no email mentioned in the scenario. | Nominal | |
| Task Comprehension | User's understanding of experimental task | Did you understand the purchase task you were asked to do?<br><br>(If chose No) What confused you about the task? | Nominal | N/A |

*Table 12 Participant involvement checks for Study 2.*

#### 4.3.2.2 Control Variables

Variables controlled for are summarized in the table below.

| VARIABLE | DEFINITION | MEANS OF CONTROL |
|---|---|---|
| PURCHASE-RELATED FACTORS | | |
| Perceived Credibility | User's perceived credibility of the online store and brand of the item | Experimental design |
| Reputation | Reputation of the online store and brand of the item | Experimental design |

| | | |
|---|---|---|
| Trust | User's trust in the online store and brand of the item) | Experimental design |
| RISK-RELATED VARIABLES | | |
| Family History of Adverse Outcome | Prior occurrence of adverse outcome in user's family | Experimental design |
| Knowledge of Adverse Outcome[10] (not controlled) | User's knowledge of the adverse outcome, i.e. skin cancer: its occurrence, manifestation, risk factors, and possible treatment options | Experimental design |

*Table 13 Control variables in Study 2.*

[10] Same as in Study 1. Upon consultation with 3 FIU PhD students, it was decided to use a combination of time spent & correct answers given to check for Knowledge of Adverse Outcome. The text relating to the basic information on skin cancer was rather detailed, and as one of the PhD students indicated, they wouldn't remember all the information. Analysis showing the results of the role of this variable in the results is indicated in the Appendix.

# 5 DATA ANALYSIS

## 5.1 Data cleaning & Sample

Prior to the experiment, multiple pilot testing has been carried out varying in choice set design and scenario characteristics. Final experimental design adopted is delineated earlier, in Chapter 4.

The data were collected from several sources: social media, FIU Masters students, College of William and Mary Masters students, and Amazon Mechanical Turk. 198 data points were removed as they were mostly empty with no decision tool assigned.

In both studies, to calculate the score on involvement with Knowledge of Adverse Outcome text the correct number of answers were added; if the respondent marked all possible answers the score was 0, and if they marked the wrong answer and at least one of the correct answers (not all though), then correct answers were added and counted as final score. The question was detailed therefore the correct answers were still counted even if the wrong answer was chosen as well. To calculate the involvement with Perceived Risk scenario, the answer to the first question – about cousin's medical condition (correct=1, incorrect=0) was added to the second question- about email received (correct=1, all possible answers marked =0, incorrect + correct=0). The wrong answer was mutually exclusive from the other answers which is why the correct answers were not taken into consideration when the wrong possibility was chosen as well. In each study respondents who a) took less than 10 seconds to read the text pertaining to knowledge of adverse outcome and answered wrong to the manipulation check question; OR b) took less than 15 seconds to read scenario and answered at least one of the manipulations questions wrong, were removed.

Responses from all data sources were investigated for duplicate participation: data points from FIU, College of William & Mary, social media, and AIS World were examined in terms of their demographics both within and across the data sources. No duplicates were found in these groups. Data points from Amazon Mechanical Turk were investigated based on the code provided (random code generated per respondent) and worker ID. Age groups of 60-64, 65-69, 70 and above were merged as one group 60+ due to a recording issue.

For Study 1, 125 data points were removed as they constituted duplicate respondents, 1 was removed, as they indicated they were under 18 years of age despite signing the consent form, 3 didn't understand purchase task, 2 didn't choose a health plan and didn't answer second part of the survey, and 40 were removed as they didn't meet the criteria for time spent reading and manipulations questions for the scenario and knowledge of adverse outcome. The data points were further examined in terms of homogeneity of responses: if a data point contained homogenous responses to the survey questions (by inspecting variations in questions and responses) and did not exhibit legible and respectable responses to open-ended questions[11], it was removed. This didn't relate to data points whose responses were not homogenous and that didn't provide an answer to the open-ended questions at all. No data points were removed based on this filter. 27 more data points were removed as they were missing 80% or above answers to the second part of the survey (including all of the answers to decision approach items). The final sample for Study 1 included 291 data points.

[11] Several open-ended questions were asked as part of the survey, and although the responses to those questions are not a part of this analysis, they were used here as part of data cleaning to triangulate the soundness of the dataset.

For Study 2, 124 data points were removed as they constituted duplicate respondents, 1 indicated that they didn't understand purchase task, 1 didn't answer major life events question properly (suggesting lack of involvement in experiment participation), 19 didn't choose a health plan and didn't answer second part of survey, and 57 were removed as they didn't meet the criteria for time spent reading and manipulations questions for the scenario and knowledge of adverse outcome. The data points were further examined in terms of homogeneity of responses: if a data point contained homogenous responses to the survey questions (by inspecting variations in questions and responses) or the responses to the open-ended questions were not legible, it was removed. This didn't relate to data points whose responses were not homogenous and that didn't provide an answer to the open-ended questions at all. 3 data points were removed this way.[12] 21 more data points were removed as they were missing 80% or above answers to the second part of the survey (including all answers to decision approach items). The final sample for Study 2 included 261 data points.

In both Study 1 and Study 2, since the respondents had a chance to change their decision, only their final choice was taken into consideration in the analysis. In Study 1, 5 of the alternatives in the choice set were merged, leaving Silver, Golden, and Golden Plus options for the analysis.

The analysis was carried out using IBM SPSS® Statistics.

[12] Alternative analysis was carried out using those data points and there were no differences found in terms of the effects of decision tools, perceived risk moderation, and decision approach moderation.

## 5.2 Study 1

### 5.2.1 Demographics

Demographic information for the sample and their involvement in the experiment for Study 1 is presented in Tables 14-16 below. The sample varied in terms of age, with most of the respondents being 35 and above (71.6%) but had a slight majority of women (64.6 %), and, furthermore, the participants were mostly Caucasian (66.3%). Most of the respondents (75.9%) individually earned USD 60k or less, but the sample varied well in terms of household income. The participants were mostly in good (39.2%) or very good (27.8%) health, with a slight prevalence of those with no chronic conditions (56.4%), and largely no recent major healthcare utilization (77.3 %). Most of the participants have not suffered from skin cancer (95.5%) and were not directly exposed to it in family (59.5%) and friends (49.5%). Around 26.5% (10.7%+15.8%) of the respondents had a medium perception for developing skin cancer and about 30.5% of the participants reported medium perception for developing cancer (11.3%+19.2%). 35.1% of the respondents indicated that they fully understood the information on skin cancer provided and 40.5% - almost fully. Most of the respondents answered correctly to the questions (or most questions) relating to the skin cancer information: 38.5% answered all 4/4 questions correctly and 33.3% answered 3/4 questions correctly. Most of the respondents scored well on their attention reading the perceived risk scenario: 47.8% of the participants answered both questions relating to the perceived risk scenario correctly and 41.2% answered 1 of them correctly. Almost half (49.1%) of the respondents indicated they were making the purchase choice extremely similarly to how they would behave in real life and 36.8% - very similarly.

| DEMOGRAPHICS |
|---|

| | # OF PARTICIPANTS | PERCENTAGE |
|---|---|---|
| Age | | |
| Missing: 0 | | |
| 18-19 | 0 | 0 |
| 20-24 | 8 | 2.7 |
| 25-29 | 12 | 4.1 |
| 30-34 | 12 | 4.1 |
| 35-39 | 47 | 16.2 |
| 40-44 | 47 | 16.2 |
| 45-49 | 43 | 14.8 |
| 50-54 | 30 | 10.3 |
| 55-59 | 41 | 14.1 |
| 60 and above | 51 | 17.5 |
| Gender | | |
| Missing: 1 | | |
| Male | 189 | 35.1 |
| Female | 102 | 64.6 |
| Ethnicity | | |
| Missing: 0 | | |
| Caucasian | 193 | 66.3 |
| African American | 18 | 6.2 |
| Native American or Alaska Native | 6 | 2.1 |
| Asian or Pacific Islander | 36 | 12.4 |
| Latino or Hispanic | 28 | 9.6 |
| Native Hawaiian or Other Pacific Islander | 1 | .3 |
| Other | 9 | 3.1 |
| Skin Color | | |
| Missing: 0 | | |
| Dark brown or Black | 8 | 2.7 |
| Medium brown | 28 | 9.6 |
| Light brown | 29 | 10.0 |
| Olive | 48 | 16.5 |
| Fair | 156 | 53.6 |
| Very fair | 22 | 7.6 |
| Marital Status | | |
| Missing: 0 | | |
| Single (never married) | 76 | 26.1 |
| Married (or in a domestic partnership) | 165 | 56.7 |
| Widowed | 7 | 2.4 |
| Divorced | 39 | 13.4 |
| Separated | 4 | 1.4 |
| Children | | |

| | | | |
|---|---|---|---|
| Missing: | 0 | | |
| Yes | | 187 | 64.3 |
| No | | 104 | 35.7 |
| Highest Educational Level | | | |
| Missing: | 0 | | |
| High School Diploma or GED | | 30 | 10.3 |
| Some college, no degree | | 63 | 21.6 |
| Associate degree (e.g. AA, AS) | | 34 | 11.7 |
| Bachelor's degree | | 107 | 36.8 |
| Master's degree | | 45 | 15.5 |
| Professional degree (e.g. MD, DDS, DVM) | | 5 | 1.7 |
| Doctorate | | 7 | 2.4 |
| Employment Status | | | |
| Missing: | 1 | | |
| Employed (part-time) | | 59 | - |
| Employed (full-time) | | 160 | - |
| Student | | 19 | - |
| including | Student & Working part-time | 5 | - |
| including | Student & Working full-time | 9 | - |
| Not employed, looking for work | | 14 | - |
| Not employed, not looking for work | | 3 | - |
| Homemaker | | 19 | - |
| Retired | | 40 | - |
| Unable to work | | 6 | - |
| Occupation | | | |
| Missing: | 4 | | |
| including | More than 1 occupation | 39 | |
| Education (student) | | 16 | - |
| Education, Training and Library (excluding being a student) | | 29 | - |
| Management | | 18 | - |
| Business and Financial Operations | | 33 | - |

| | | |
|---|---|---|
| Computer and Mathematical | 33 | - |
| Architecture and Engineering | 8 | - |
| Healthcare Practitioner and Technical | 11 | - |
| Healthcare Support | 12 | - |
| Legal | 2 | - |
| Sales and Related | 34 | - |
| Office and Administrative Support | 41 | - |
| Arts, Design, Entertainment, Sports and Media | 14 | - |
| Life, Physical and Social Sciences | 4 | - |
| Food Preparation and Serving-related | 9 | - |
| Transportation and Moving | 7 | - |
| Building and Grounds Cleaning and Maintenance | 3 | - |
| Production | 11 | - |
| Other | 57 | - |
| Annual Personal Income | | |
| Missing: 0 | | |
| $0-20,000 | 83 | 28.5 |
| $20,001-40,000 | 87 | 29.9 |
| $40,001-60,000 | 51 | 17.5 |
| $60,001-80,000 | 28 | 9.6 |
| $80,001-100,000 | 19 | 6.5 |
| More than $100,000 | 16 | 5.5 |
| Decline | 7 | 2.4 |
| Household Personal Income | | |
| Missing: 1 | | |
| $0-20,000 | 46 | 15.8 |
| $20,001-40,000 | 66 | 22.7 |
| $40,001-60,000 | 45 | 15.5 |
| $60,001-80,000 | 37 | 12.7 |
| $80,001-100,000 | 37 | 12.7 |
| More than $100,000 | 49 | 16.8 |
| Decline | 10 | 3.4 |

*Table 14 Demographics for Study 1.*

| DEMOGRAPHICS RELATED TO HEALTH STATUS | | |
|---|---|---|
| | # OF PARTICIPANTS | PERCENTAGE |

| | | | |
|---|---|---|---|
| Health Status | | | |
| Missing: | 2 | | |
| Poor | | 10 | 3.4 |
| Fair | | 61 | 21.0 |
| Good | | 114 | 39.2 |
| Very good | | 81 | 27.8 |
| Excellent | | 23 | 7.9 |
| Chronic condition | | | |
| Missing: | 5 | | |
| Yes | | 121 | 41.6 |
| No | | 164 | 56.4 |
| Error (both Yes & No indicated) | | 1 | .3 |
| Cigarette Use | | | |
| Missing: | 1 | | |
| Regularly | | 44 | 15.1 |
| Occasionally | | 25 | 8.6 |
| No | | 221 | 75.9 |
| Health Services Utilization | | | |
| Missing: | 1 | | |
| 0 inpatient stays or ER visits | | 225 | 77.3 |
| 1 inpatient stay or ER visit | | 47 | 16.2 |
| More than 1 inpatient stays or ER visits | | 18 | 99.7 |
| Individual perceived risk for skin cancer | | | |
| Mean: | 5.11 | | |
| Missing: | 0 | | |
| =0 Not likely at all | | 23 | 7.9 |
| 1 | | 29 | 10.0 |
| 2 | | 36 | 12.4 |
| 3 | | 32 | 11.0 |
| 4 | | 31 | 10.7 |
| 5 | | 46 | 15.8 |
| 6 | | 37 | 12.7 |
| 7 | | 41 | 14.1 |
| 8 | | 8 | 2.7 |
| =9 Extremely likely | | 8 | 2.7 |
| Individual perceived risk for cancer | | | |
| Mean: | 5.70 | | |
| Missing: | 0 | | |
| =0 Not likely at all | | 17 | 5.8 |
| 1 | | 22 | 7.6 |

| | | | |
|---|---|---|---|
| 2 | | 21 | 7.2 |
| 3 | | 23 | 7.9 |
| 4 | | 33 | 11.3 |
| 5 | | 56 | 19.2 |
| 6 | | 52 | 17.9 |
| 7 | | 39 | 13.4 |
| 8 | | 15 | 5.2 |
| =9 Extremely likely | | 13 | 4.5 |
| Prior exposure to skin cancer (Self) | | | |
| Missing: | 1 | | |
| Yes | | 12 | 4.1 |
| No | | 278 | 95.5 |
| Prior exposure to skin cancer (Family) | | | |
| Missing: | 0 | | |
| Yes | | 86 | 29.6 |
| No | | 173 | 59.5 |
| Don't Know | | 32 | 11.0 |
| Prior exposure to skin cancer (Friends & Acquaintances) | | | |
| Missing: | 1 | | |
| Yes | | 109 | 37.5 |
| No | | 144 | 49.5 |
| Don't Know | | 37 | 12.7 |

*Table 15 Demographics for Study 1 related to respondent's health status.*

| KNOWLEDGE OF ADVERSE OUTCOME & INVOLVEMENT CHECKS | | | |
|---|---|---|---|
| | | # OF PARTICIPANTS | PERCENTAGE |
| Knowledge of Adverse Outcome | | | |
| Missing: | 1 | | |
| Mean: | 4.09 | | |
| According to you, to what extent does the text about skin cancer that you just read contain new or known information? | | | |
| =1 Much known information | | 25 | 8.6 |
| 2 | | 48 | 16.5 |
| 3 | | 42 | 14.4 |
| 4 | | 34 | 11.7 |

| | | | |
|---|---|---|---|
| 5 | | 72 | 24.7 |
| 6 | | 41 | 14.1 |
| = 7 Much new information | | 28 | 9.6 |
| Missing: | 0 | | |
| Mean: | 6.01 | | |
| To what extent did you understand the information presented in the text about skin cancer that you just read? | | | |
| =1 Not at all | | 1 | .3 |
| 2 | | 1 | .3 |
| 3 | | 5 | 1.7 |
| 4 | | 12 | 4.1 |
| 5 | | 52 | 17.9 |
| 6 | | 118 | 40.5 |
| =7 Fully | | 102 | 35.1 |
| Task Involvement | | | |
| Mean: | 13.72 | | |
| Missing: | 5 | | |
| When you were choosing the health insurance plan, to what extent were you:<br>• Involved<br>• Interested<br>• Putting effort | | - | - |
| Mean: | 6.25 | | |
| Missing: | 1 | | |
| When you were choosing the health insurance plan, to what extent were you making the decision as if you were really making it in real life? | | | |
| Not at all | | 3 | 1.0 |
| Very little | | 2 | .7 |
| A little | | 1 | .3 |
| Somewhat | | 10 | 3.4 |
| Moderately | | 24 | 8.2 |
| Very | | 107 | 36.8 |
| Extremely | | 143 | 49.1 |
| Knowledge of Adverse Outcome control involvement | | | |

| | | | |
|---|---|---|---|
| Missing: | 1 | | |
| Which of the following include skin cancer risk factors according to the text that you just read? | | | |
| 0/4 Answers Correct or 5/4 | | 22 | 7.6 |
| 1/4 Answer Correct | | 7 | 2.4 |
| 2/4 Answers Correct | | 52 | 17.9 |
| 3/4 Answers Correct | | 97 | 33.3 |
| 4/4 Answers Correct | | 112 | 38.5 |
| Perceived Risk manipulation involvement | | | |
| Missing: | 0 | | |
| What was the medical condition that your cousin suffered from in the scenario that you read?<br><br>What was the email about – that you were said to have received – in the scenario that you read? | | | |
| 0/2 Answers Correct | | 32 | 11.0 |
| 1/2 Answer Correct | | 120 | 41.2 |
| 2/2 Answers Correct | | 139 | 47.8 |

*Table 16 Knowledge of Adverse Outcome & Involvement checks for Study 1.*

### 5.2.2 Manipulation checks

Table 17 below demonstrates the methods used to check whether the manipulations of decision tools and perceived risk had a significant impact on the user: the price they paid for the health plan and their perceived health risk.

| EXPERIMENTAL MANIPULATION | | MANIPULATION CHECK | STATISTICAL TEST |
|---|---|---|---|
| Decision Tool: | • Non-compensatory Descending High Price Anchor<br>• Non-compensatory | 1) Comparison of item purchased by users of each of the tools. | Mantel-Haenszel test |

| | | | |
|---|---|---|---|
| | Descending Low Price Anchor<br>• Non-compensatory Descending No Anchor | | |
| High Perceived Risk | | Comparison of average subjective probability of developing skin cancer as per scenario | Kruskal-Wallis |

*Table 17 Methods and statistical tests used for manipulation checks in Study 1.*

Mantel-Heanszel test (Linear-by-Linear Association) was carried out as a manipulation check to test the effects of NC Descending with High Price Anchor, NC Descending with Low Price Anchor, and NC Descending with No Anchor tools on user's decision quality. This test is used for datasets containing ordinal variables and for trends with contingency tables larger than 2x2. Results for the analysis, as shown in Table 18, indicate that there is a significant effect of the three decision tools on decision quality (plan purchased) by the user: $\chi^2$MH = 16.237, (1 d.f., N=272) p = .00005. (Full analysis is provided further below)

Kruskal-Wallis test was carried out as a manipulation check to test the effects of the scenarios on user's perceived risk. Kruskal-Wallis constitutes a non-parametric test to compare two or more independent samples. Results for the analysis, as shown in Table 19 and Figure 13, indicate that there is a significant effect of the scenarios on user's perceived risk: H = 77.699, (1 d.f., N=289) p = .00000. Boxplots in Figure 10 below indicates that the perceived risk exhibited by users provided with High Perceived Risk scenario was significantly higher than that of users provided with Low Perceived Risk scenario.

| MANIPULATION CHECK – DECISION TOOLS | | | |
|---|---|---|---|
| MANTEL-HAENZEL RESULT | | | |
| Dependent Variable: Plan purchased | | | |
| Source: Decision tools | | | |
| Total N | Linear-by-Linear Association | Degrees of Freedom | Exact Significance (2-sided) |
| 272 | 16.237 | 1 | .00005 |

*Table 18 Manipulation check for decision tools - Study 1.*

| MANIPULATION CHECK – PERCEIVED RISK | | | |
|---|---|---|---|
| KRUSKAL-WALLIS RESULT | | | |
| Dependent Variable: Perceived Risk | | | |
| Source: Scenario | | | |
| Total N | Test Statistic | Degrees of Freedom | Asymptotic Sig. (2-sided test) |
| 289 | 77.699 | 1 | .00000 |

*Table 19 Manipulation check for perceived risk - Study 1.*

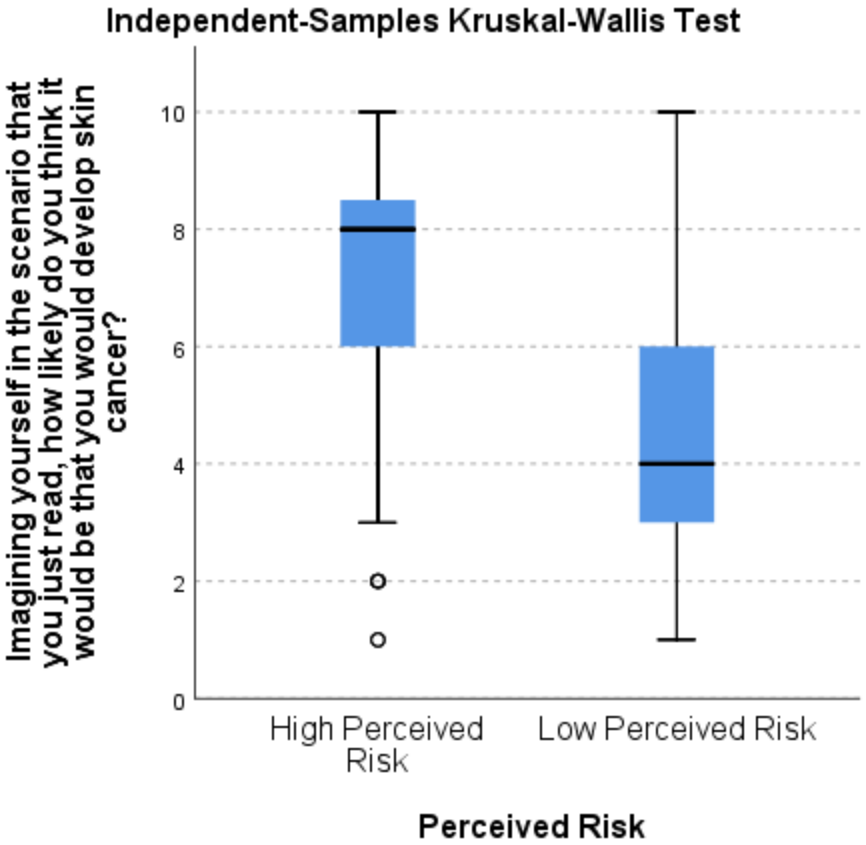



*Figure 13 Boxplots of perceived risk across groups in Study1.*

### 5.2.3 Hypotheses Testing

#### 5.2.3.1 CROSSTABULATION ANALYSIS FOR PLAN PURCHASED

Cross-tabulation (Mantel-Heanszel test) was carried out to examine the effects of the three decision tools (NC Descending Anchor HP, NC Descending Anchor LP, and NC Descending with No Anchor) on user's decision quality.

Results of cross-tabulation analysis (shown in Table 20 below) indicate that there is a significant impact of the usage of the three decision tools on user's decision quality with $\chi^2$MH = 16.237 (1 d.f., N=272), p = .00005.

Users making the purchase choice with NC Descending Anchor LP tool purchased the Golden Plus plan (most expensive with the greatest extent of coverage) significantly more frequently than users of the NC Descending Anchor HP tool ($p<.05$).

Users making the choice with NC Descending tool with HP Anchor purchased the Golden plan (second most expensive with second highest extent of coverage significantly more frequently than users making the decision with NC Descending Anchor LP tool ($p<.05$), although not significantly more frequently than users of NC Descending tool with No Anchor. Users purchasing the plan with NC Descending tool with No Anchor purchased the Golden plan significantly more frequently than users of the NC Descending Anchor LP tool ($p<.05$).

There was a significant difference in the frequency of the other plans in the choice set (Silver & Others) purchased between NC Descending Anchor HP and NC Descending with No Anchor ($p<.05$).

There frequency of purchase of the remaining plans (Silver & Other) in the choice set using NC Descending Anchor LP did not differ significantly from the other two tools.

| CROSSTABULATION RESULTS: Plan Purchased * Decision Tool | | | | | |
|---|---|---|---|---|---|
| Plan Purchased | | NC Descending Anchor HP | NC Descending Anchor LP | NC Descending NO Anchor | Total |
| Golden Plus | Count | 15a | 31b | 0c | 46 |
| | Residual | -1.7 | 16.8 | -15.1 | |
| Golden | Count | 50a | 13b | 32a | 95 |
| | Residual | 34.6 | 29.3 | 31.1 | |
| Silver & Other | Count | 34a | 40a, b | 57b | 131 |
| | Residual | -13.7 | -.5 | 14.1 | |
| Each subscript letter denotes a subset of Decision Tool categories whose column proportions do not differ significantly from each other at the .05 level | | | | | |
| **Linear-by-Linear Association** (1, N=272) = 16.237, (Exact sig.) p =.00005 | | | | | |
| **Phi** = .468, (Exact sig.) p = .00000<br>**Cramer's V** = .331, (Exact sig.) p = .00000 | | | | | |

*Table 20 Crosstabulation analysis for Study 1.*

Figure 14 below shows the frequency of the plans purchased across the three decision tools.

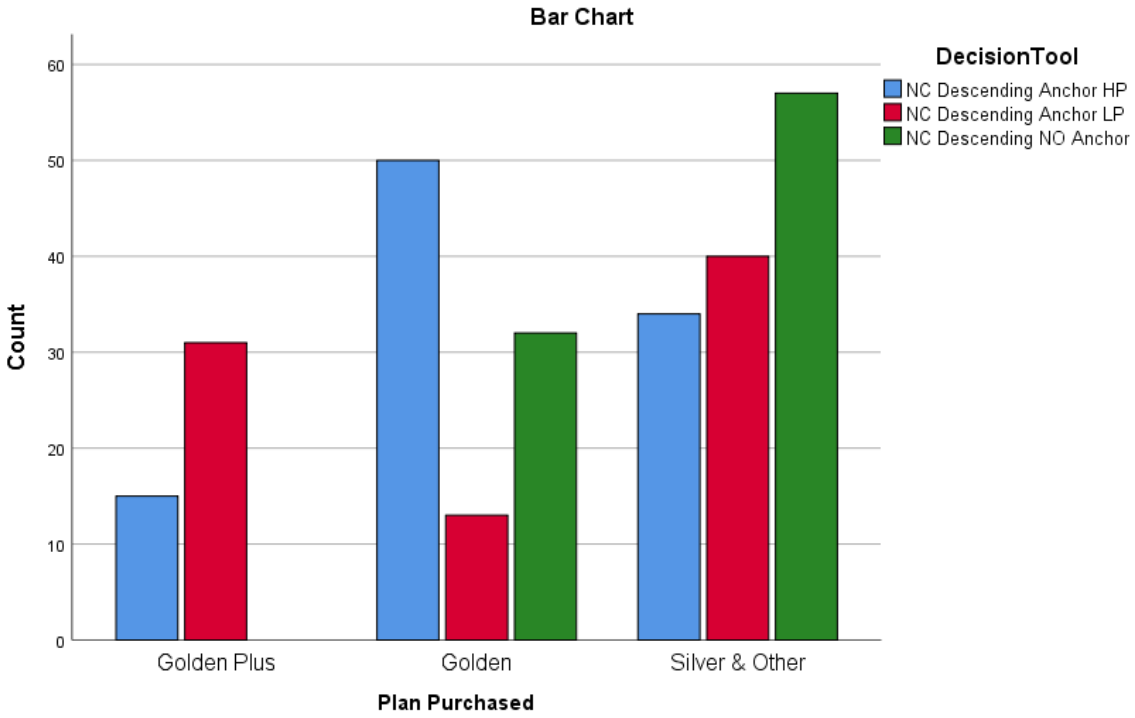



*Figure 14 Frequency of plans purchased across decision tools - Study 1.*

5.2.3.2 PERCEIVED RISK MODERATION ANALYSIS

Cross-tabulation (Mantel-Heanszel test) was carried out to examine whether perceived risk moderates the effects of the three decision tools (NC Descending Anchor HP, NC Descending Anchor LP, and NC Descending with No Anchor) on user's decision quality.

Results of cross-tabulation analysis (Table 21 below) indicate that there is a significant impact of the usage of the three decision tools on user's decision quality under high perceived risk with $\chi^2$MH = 7.909 (1 d. f., N=146), p = .00499 as well as under low perceived risk with $\chi^2$MH = 4.501 (1 d. f., N=126), p = .03891. However, post-hoc analysis demonstrates that the dynamics of the effects of these decision tools on user's decision quality differ.

The results show that under high perceived risk the dynamics of frequency of plan purchase was the same as in the general analysis.

Under high perceived risk, users making the purchase choice with NC Descending Anchor LP tool purchased the Golden Plus plan (most expensive with the greatest extent of coverage) significantly more frequently than users of the NC Descending Anchor HP tool ($p<.05$). Users making the choice with NC Descending tool with HP Anchor purchased the Golden plan (second most expensive with second highest extent of coverage significantly more frequently than users making the decision with NC Descending Anchor LP tool ($p<.05$), although not significantly more frequently than users of NC Descending tool with No Anchor. Users purchasing the plan with NC Descending tool with No Anchor purchased the Golden plan significantly more frequently than users of the NC Descending Anchor LP tool ($p<.05$).

Under high perceived risk, there was a significant difference in the frequency of the other plans in the choice set (Silver & Others) purchased between NC Descending Anchor HP and NC Descending with No Anchor ($p<.05$). The frequency of purchase of the remaining plans (Silver & Other) in the choice set using NC Descending Anchor LP did not differ significantly from the other two tools.

The dynamics of plan purchase changed though for users under low perceived risk.

Under low perceived risk, the effect of NC Descending tool with anchor LP changed: there was no significant difference in the frequency of purchase of the Golden Plus plan across tools with Anchor LP and Anchor HP. However, under low perceived risk, the frequency of purchase of plan Golden remained significantly higher when making the choice with NC Descending with Anchor HP tool than Anchor LP ($p<.05$). The choice of this plan didn't differ significantly in NC Descending tool with No Anchor from the other two tools.

Also, under low perceived risk there were no significant differences in the purchase of the remaining plans (Silver & Other) across all three decision tools.

| | CROSSTABULATION RESULTS: Plan Purchased * Decision Tool* Perceived Risk | | | | | |
|---|---|---|---|---|---|---|
| | Plan Purchased | | NC Descending Anchor HP | NC Descending Anchor LP | NC Descending NO Anchor | Total |
| High Perceived Risk | Golden Plus | Count | 12a | 20b | 0c | 32 |
| | | Residual | -2.2 | 11.9 | -9.6 | |
| | Golden | Count | 38a | 7b | 22a | 67 |
| | | Residual | 8.2 | -10 | 1.8 | |
| | Silver & Other | Count | 15a | 10 a, b | 22b | 47 |
| | | Residual | -5.9 | -1.9 | 7.8 | |
| Low Perceived Risk | Golden Plus | Count | 3a, b | 11b | 0a | 14 |
| | | Residual | -.8 | 5.8 | -5.0 | |
| | Golden | Count | 12a | 6b | 10a, b | 28 |
| | | Residual | 4.4 | -4.4 | .0 | |
| | Silver & Other | Count | 19a | 30a | 35a | 84 |
| | | Residual | -3.7 | -1.3 | 5 | |
| | Each subscript letter denotes a subset of Decision Tool categories whose column proportions do not differ significantly from each other at the .05 level | | | | | |
| **High Perceived Risk** | **Linear-by-Linear Association** (1, N=146) = 7.907, (Exact sig.) p=.00499 | | | | | |
| | **Phi** = .536, (Exact sig.) p =.00000<br>**Cramer's V** = .379, (Exact sig.) p=.00000 | | | | | |
| **Low Perceived Risk** | **Linear-by-Linear Association** (1, N=126) = 4.501, (Exact sig.) p=.03891 | | | | | |
| | **Phi** = .373, (Exact sig.) p =.00124<br>**Cramer's V** = .264, (Exact sig.) p=.00124 | | | | | |

*Table 21 Crosstabulation results for Study 1 testing perceived risk moderation.*

Figures 15 and 16 below show the frequency of plans purchased across the three decision tools under high and low perceived risk.

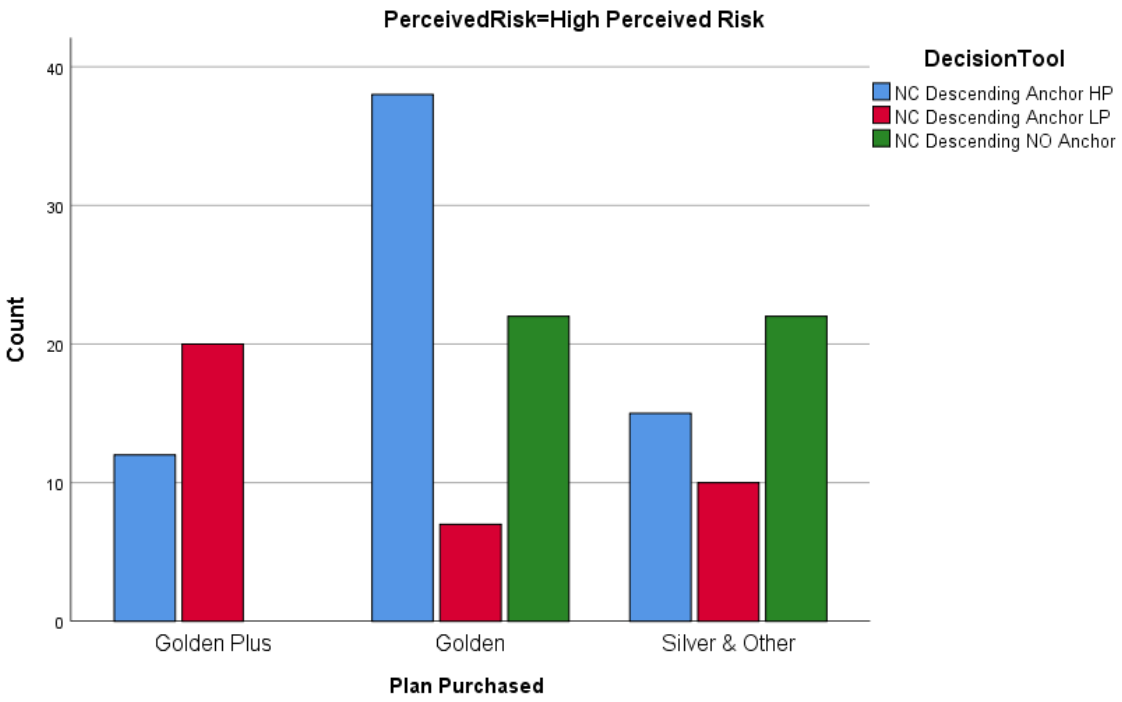



*Figure 15 Frequency of plans chosen across decision tools under high perceived risk.*

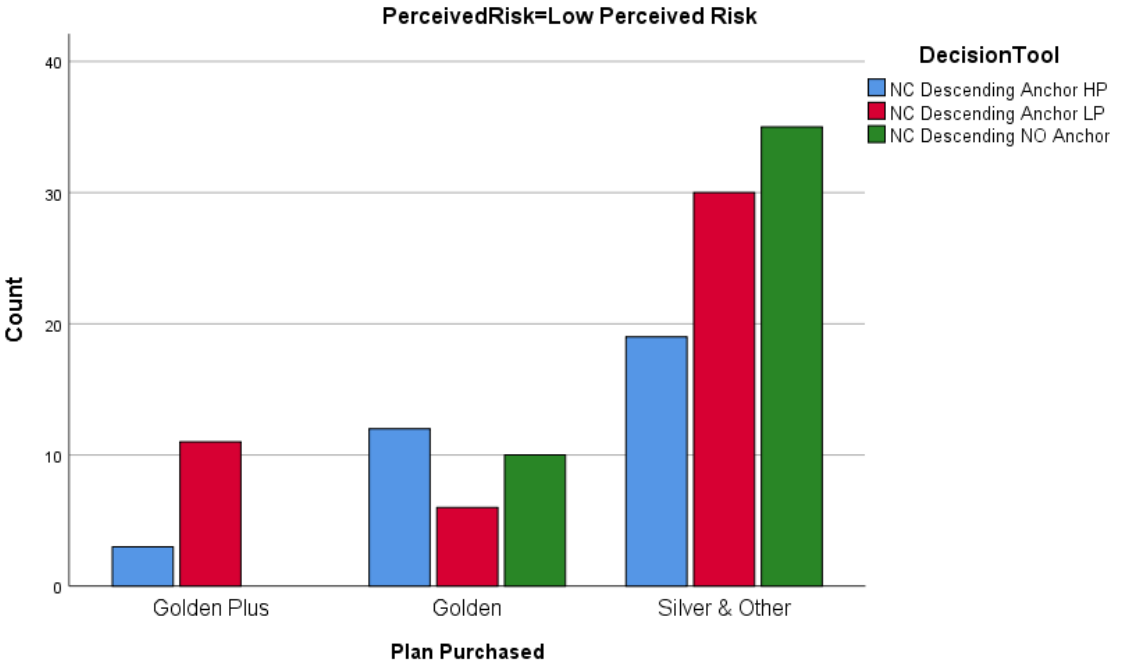



*Figure 16 Frequency of plans chosen across decision tools under low perceived risk.*

5.2.3.3 DECISION APPROACH MODERATION ANALYSIS

To compute Strong vs. Weak Price Heuristics-driven Decision Approach, the mean for decision approach was calculated m=19.3662 (Figure 17 below), and any respondents scoring 1-19.365 were coded as Strong Price Heuristic and participants scoring 19.3651 and above were coded as driven Weakly by Price Heuristics.

| Statistics | | |
|---|---|---|
| Decision Approach | | |
| N | Valid | 284 |
| | Missing | 7 |
| Mean | | 19.3662 |
| Median | | 19.0000 |
| Std. Deviation | | 4.70092 |
| Range | | 24.0 |
| Minimum | | 4.00 |
| Maximum | | 28.00 |

*Figure 17 Descriptive statistics for decision approach in Study 1.*

Cross-tabulation (Mantel-Heanszel test) was carried out to examine whether decision approach moderates the effects of the three decision tools (NC Descending Anchor HP, NC Descending Anchor LP, and NC Descending with No Anchor) on user's decision quality.

Results of cross-tabulation analysis (Table 22) indicate that there is a significant impact of the usage of the three decision tools on user's decision quality for users driven strongly by price heuristics with $\chi^2$MH = 13.742 (1 d.f., N=132) p = .00016 as well as for those driven

weakly by price heuristics with $\chi^2$MH = 12.108 (1 d.f., N=135), p = .000497. However, post-hoc analysis demonstrates that the dynamics of the effects of these decision tools on user's decision quality differ.

The results show that the dynamics of frequency of plan purchase using the three tools by users weakly driven by price heuristic resembled the dynamics of the effects of the tools in the general analysis.

For users driven weakly by price heuristics, users making the purchase choice with NC Descending Anchor LP tool purchased the Golden Plus plan (most expensive with the greatest extent of coverage) significantly more frequently than users of the NC Descending Anchor HP tool ($p<.05$). Users making the choice with NC Descending tool with HP Anchor purchased the Golden plan (second most expensive with second highest extent of coverage significantly more frequently than users making the decision with NC Descending Anchor LP tool ($p<.05$), although not significantly more frequently than users of NC Descending tool with No Anchor. Users purchasing the plan with NC Descending tool with No Anchor purchased the Golden plan significantly more frequently than users of the NC Descending Anchor LP tool ($p<.05$).

For users driven weakly by price heuristics, there was a significant difference in the frequency of the other plans in the choice set (Silver & Others) purchased between NC Descending Anchor HP and NC Descending with No Anchor ($p<.05$). The frequency of purchase of the remaining plans (Silver & Other) in the choice set using NC Descending Anchor LP did not differ significantly from the other two tools.

The dynamics of plan purchase changed though for users driven strongly by price heuristics.

For users driven strongly by price heuristics, the effect of NC Descending tool with anchor LP changed: there was no significant difference in the frequency of purchase of the Golden Plus plan across tools with Anchor LP and Anchor HP. However, for those users, the frequency of purchase of plan Golden remained significantly higher when making the choice with NC Descending with Anchor HP tool than both: NC Descending Anchor LP and with No Anchor ($p<.05$). The choice of this plan didn't differ in NC Descending tool Anchor LP and with No Anchor.

Also, the frequency of purchase of the remaining plans (Silver & Other) for users driven strongly by price heuristics didn't differ significantly across NC Descending Anchor HP and LP. Those plans were however purchased significantly more frequently in NC Descending tool with No Anchor than with NC descending Anchor HP ($p<.05$) and Anchor LP ($p<.05$).

| CROSSTABULATION RESULTS: Plan Purchased * Decision Tool* Decision Approach | | | | | | |
|---|---|---|---|---|---|---|
| | Plan Purchased | | NC Descending Anchor HP | NC Descending Anchor LP | NC Descending NO Anchor | Total |
| Strong Price Heuristic | Golden Plus | Count | 5a, b | 7b | 0a | 12 |
| | | Residual | .4 | 3.1 | -3.5 | |
| | Golden | Count | 21a | 6b | 3b | 30 |
| | | Residual | 9.4 | -3.8 | -5.6 | |
| | Silver & Other | Count | 25a | 30 a | 35b | 90 |
| | | Residual | -9.8 | .7 | 9.1 | |
| | Golden Plus | Count | 10a | 24b | 0c | 34 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Weak Price Heuristic | | Residual | -1.1 | 13.9 | -12.8 | |
| | Golden | Count | 27a | 7b | 29a | 63 |
| | | Residual | 6.5 | -11.7 | 5.2 | |
| | Silver & Other | Count | 7a | 9a, b | 22b | 38 |
| | | Residual | -5.4 | -2.3 | 7.6 | |
| | Each subscript letter denotes a subset of Decision Tool categories whose column proportions do not differ significantly from each other at the .05 level | | | | | |
| **Strong Price Heuristic** | **Linear-by-Linear Association** (1, N=132) = 13.742, (Exact sig.) p=.00016 | | | | | |
| | **Phi** = .432, (Exact sig.) p =.00004<br>**Cramer's V** = .306, (Exact sig.) p=.00004 | | | | | |
| **Weak Price Heuristic** | **Linear-by-Linear Association** (1, N=135) = 12.108, (Exact sig.) p=.000497 | | | | | |
| | **Phi** = .606, (Exact sig.) p =.00000<br>**Cramer's V** = .428, (Exact sig.) p=.00000 | | | | | |

*Table 22 Crosstabulation results for Study 1 testing decision approach moderation.*

Frequency of plan purchased across the three decision tools by users driven strongly and weakly by price heuristics is shown in Figures 18 and 19 below.

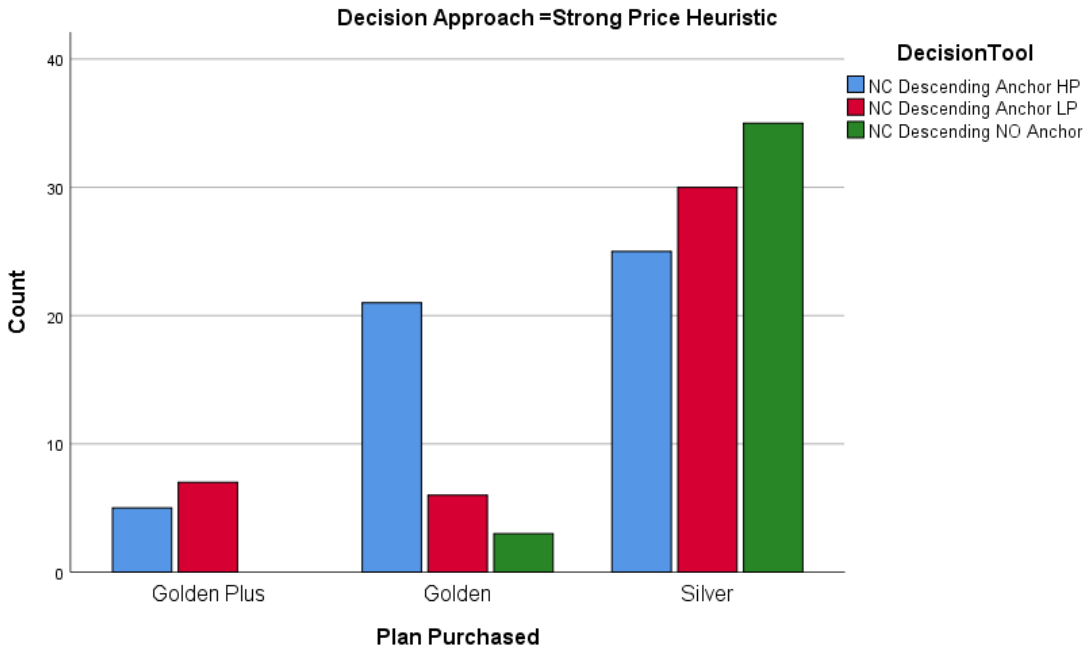



*Figure 18 Frequency of plans purchased across the decision tools for users driven strongly by price heuristics.*

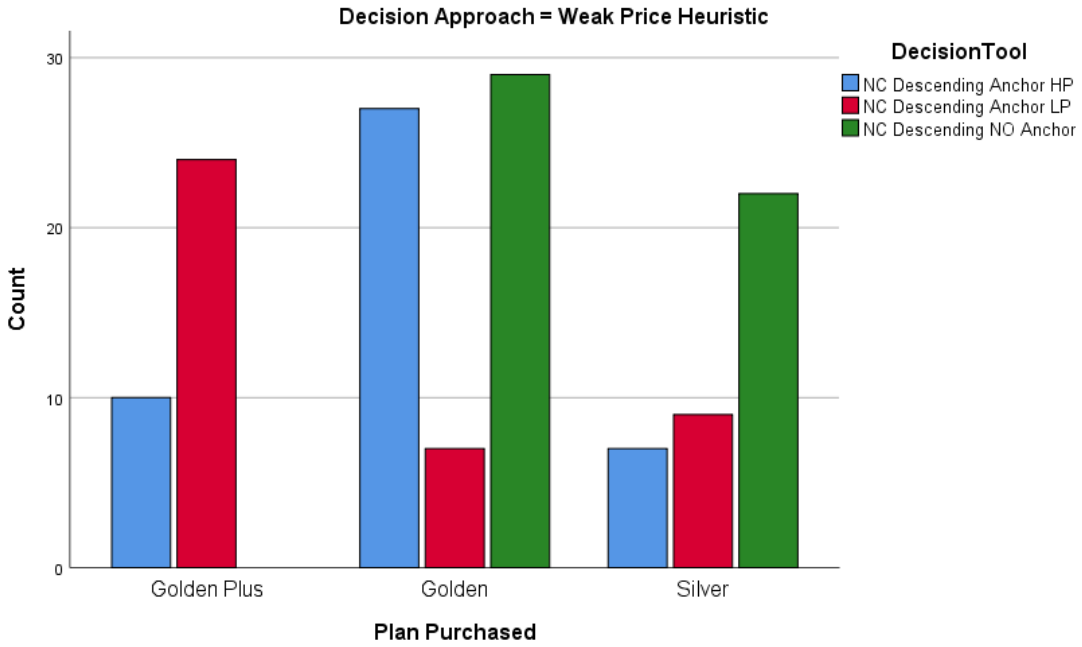



*Figure 19 Frequency of plans purchased across the decision tools for users driven weakly by price heuristics.*

Results of hypothesis testing for Study 1 are summarized in Table 23 below.

| HYPOTHESIS | RESULT | p-value |
|---|---|---|
| *H1. The effect of the usage of NC Descending tool with a low-price anchor will be negative and the effects of usage of NC Descending tool with a high-price anchor and NC Descending tool with no anchor on user's decision quality will be positive, such that:* | | |
| *H1A. Users will purchase the health plan with greatest coverage and highest price with NC Descending tool with a low-price anchor more frequently than with NC Descending tool with high-price anchor.* | SUPPORTED | <.05 |
| *H1B. Users will purchase the second-most expensive and second in terms of extent of coverage – health plan using NC Descending tool with a high-price anchor more frequently than with NC Descending with a low-price anchor.* | SUPPORTED | <.05 |

| | | | |
|---|---|---|---|
| | *H1C. Users will purchase a health plan with greatest coverage and highest price with NC Descending tool with a low-price anchor more frequently than with NC Descending with no anchor.* | SUPPORTED | <.05 |
| *H2. Perceived risk moderates the effect of NC Descending with a high-price anchor and NC Descending with low-price anchor such that the effect of the usage of NC Descending tool with a low-price anchor will be negative and the effects of NC Descending tool with a high-price anchor will be positive on user's decision quality under high perceived risk, but not under low perceived risk.*<br><br>*Under high perceived risk the users will purchase the health plan with greatest coverage and highest price with NC Descending tool with a low-price anchor more frequently than with NC Descending tool with high-price anchor, but there will be no differences in this plan purchase for users under low perceived risk.* | | SUPPORTED | <.05 |
| *H3. Decision approach moderates the effect of NC Descending with a high-price anchor and NC Descending with low-price anchor such that the effect of the usage of NC Descending tool with a low-price anchor will be negative and the effect of NC Descending tool with a high-price anchor will be positive on user's decision quality for users driven weakly by price heuristics, but not for users driven strongly by price heuristics.*<br><br>*Users driven weakly by price heuristics will purchase the health plan with greatest coverage and highest price with NC Descending tool with a low-price anchor than the item purchased with NC Descending tool with high-price anchor, but there will be no difference in this plan purchase for users driven strongly by price heuristics.* | | SUPPORTED | <.05 |

*Table 23 Hypotheses testing for Study 1.*

## 5.3 Study 2

### 5.3.1 Demographics

Demographic information for the sample and their involvement in the experiment for Study 2 is presented in Tables 24-26 below. The nature of these demographics is characterized by a similar pattern to the sample of Study 1. The age of the participants in the sample was predominantly 35 and above – around 88.8% - and had a majority of women (62.5 %); furthermore, the participants were mostly Caucasian (70.5%). Most of the participants, circa 88.8 %, individually earned USD 80k or less, but the sample varied in terms of annual personal and household income. The participants were mostly in good (45.2%) or very good (26.8%) health, with a slight prevalence of those with no chronic conditions (54%), and largely no recent major healthcare utilization (80.8 %). Most of the participants have not suffered from skin cancer (95.8%) and were not directly exposed to it in family (62.1%) and friends (54.8%). Around 33% (11.5%+21.5%) of the respondents had a medium perception for developing skin cancer and about 37.2% of the participants reported medium perception for developing cancer (11.1%+26.1%). 44.4% of the respondents indicated that they fully understood the information on skin cancer provided and 34.5% - almost fully. Most of the respondents answered correctly to the questions (or most questions) relating to the skin cancer information: 36.8% answered all 4/4 questions correctly and 37.2% answered 3/4 questions correctly. Most of the respondents scored well on their attention reading the perceived risk scenario: 47.9% of the participants answered both questions relating to the perceived risk scenario correctly and 39.8% answered 1 of them correctly. 42.9 % of the respondents indicated they were making the purchase choice extremely similarly to how they would behave in real life and 30.7% - very similarly.

| DEMOGRAPHICS | | | |
|---|---|---|---|
| | | # OF PARTICIPANTS | PERCENTAGE |
| Age | | | |
| Missing: | 1 | | |
| 18-19 | | 0 | 0 |
| 20-24 | | 2 | .8 |
| 25-29 | | 11 | 4.2 |
| 30-34 | | 15 | 5.7 |
| 35-39 | | 46 | 17.6 |
| 40-44 | | 40 | 15.3 |
| 45-49 | | 35 | 13.4 |
| 50-54 | | 40 | 15.3 |
| 55-59 | | 27 | 10.3 |
| 60 and above | | 44 | 16.9 |
| Gender | | | 99.6 |
| Missing: | 1 | | |
| Male | | 97 | 37.2 |
| Female | | 163 | 62.5 |
| Ethnicity | | | |
| Missing: | 5 | | |
| Caucasian | | 184 | 70.5 |
| African American | | 19 | 7.3 |
| Native American or Alaska Native | | 1 | .4 |
| Asian or Pacific Islander | | 25 | 9.6 |
| Latino or Hispanic | | 27 | 10.3 |
| Other | | 5 | |
| Skin Color | | | |
| Missing: | 0 | | |
| Dark brown or Black | | 11 | 4.2 |
| Medium brown | | 22 | 8.4 |
| Light brown | | 23 | 8.8 |
| Olive | | 33 | 12.8 |
| Fair | | 153 | 58.6 |
| Very fair | | 19 | 7.3 |
| Marital Status | | | |
| Missing: | 0 | | |
| Single (never married) | | 65 | 24.9 |
| Married (or in a domestic partnership) | | 148 | 55.9 |
| Widowed | | 9 | 3.4 |
| Divorced | | 35 | 13.4 |
| Separated | | 6 | 2.3 |
| Children | | | |
| Missing: | 0 | | |

| | | | |
|---|---|---|---|
| Yes | | 176 | 67.4 |
| No | | 85 | 32.6 |
| Highest Educational Level | | | |
| Missing: | 1 | | |
| High School Diploma or GED | | 21 | 8.0 |
| Some college, no degree | | 55 | 21.1 |
| Associate degree (e.g. AA, AS) | | 29 | 11.1 |
| Bachelor's degree | | 97 | 37.2 |
| Master's degree | | 48 | 18.4 |
| Professional degree (e.g. MD, DDS, DVM) | | 6 | 2.3 |
| Doctorate | | 4 | 1.5 |
| Employment Status | | | |
| Missing: | 0 | | |
| Employed (part-time) | | 50 | - |
| Employed (full-time) | | 153 | - |
| Student | | 19 | - |
| including | Student & Working part-time | 5 | - |
| including | Student & Working full-time | 9 | - |
| Not employed, looking for work | | 11 | - |
| Not employed, not looking for work | | 1 | - |
| Homemaker | | 15 | - |
| Retired | | 19 | - |
| Unable to work | | 10 | - |
| Occupation | | | |
| Missing: | 6 | | |
| including | More than 1 occupation | 28 | |
| Education (student) | | 12 | - |
| Education, Training and Library (excluding being a student) | | 23 | - |
| Management | | 25 | - |
| Business and Financial Operations | | 27 | - |
| Computer and Mathematical | | 27 | - |

| | | |
|---|---|---|
| Architecture and Engineering | 4 | - |
| Healthcare Practitioner and Technical | 17 | - |
| Healthcare Support | 19 | - |
| Legal | 5 | - |
| Sales and Related | 24 | - |
| Office and Administrative Support | 35 | - |
| Arts, Design, Entertainment, Sports and Media | 13 | - |
| Life, Physical and Social Sciences | 7 | - |
| Food Preparation and Serving-related | 10 | - |
| Transportation and Moving | 3 | - |
| Building and Grounds Cleaning and Maintenance | 2 | - |
| Production | 12 | - |
| Other | 33 | - |
| Annual Personal Income | | |
| Missing: 0 | | |
| $0-20,000 | 65 | 24.9 |
| $20,001-40,000 | 64 | 24.5 |
| $40,001-60,000 | 58 | 22.2 |
| $60,001-80,000 | 43 | 16.5 |
| $80,001-100,000 | 13 | 5.0 |
| More than $100,000 | 16 | 6.1 |
| Decline | 2 | .8 |
| Household Personal Income | | |
| Missing: 0 | | |
| $0-20,000 | 36 | 13.8 |
| $20,001-40,000 | 55 | 21.1 |
| $40,001-60,000 | 48 | 18.4 |
| $60,001-80,000 | 44 | 16.9 |
| $80,001-100,000 | 28 | 10.7 |
| More than $100,000 | 47 | 18.0 |
| Decline | 3 | 1.1 |

*Table 24 Demographical data for Study 2.*

| DEMOGRAPHICS RELATED TO HEALTH STATUS | | |
|---|---|---|
| | # OF PARTICIPANTS | PERCENTAGE |
| Health Status | | |

| | | | |
|---|---|---|---|
| Missing: | 1 | | |
| Poor | | 4 | 1.5 |
| Fair | | 56 | 21.5 |
| Good | | 119 | 45.2 |
| Very good | | 70 | 26.8 |
| Excellent | | 12 | 4.6 |
| Chronic condition | | | |
| Missing: | 9 | | |
| Yes | | 110 | 42.1 |
| No | | 141 | 54.0 |
| Error (both Yes & No indicated) | | 1 | 4 |
| Cigarette Use | | | |
| Missing: | 1 | | |
| Regularly | | 38 | 14.6 |
| Occasionally | | 13 | 5.0 |
| No | | 208 | 79.7 |
| Health Services Utilization | | | |
| Missing: | 3 | | |
| 0 inpatient stays or ER visits | | 211 | 80.8 |
| 1 inpatient stay or ER visit | | 36 | 13.8 |
| More than 1 inpatient stays or ER visits | | 11 | 4.2 |
| Individual perceived risk for skin cancer | | | |
| Mean: | 4.97 | | |
| Missing: | 2 | | |
| =0 Not likely at all | | 14 | 5.4 |
| 1 | | 26 | 10.0 |
| 2 | | 36 | 13.8 |
| 3 | | 36 | 13.8 |
| 4 | | 30 | 11.5 |
| 5 | | 56 | 21.5 |
| 6 | | 30 | 11.5 |
| 7 | | 15 | 5.7 |
| 8 | | 6 | 2.3 |
| =9 Extremely likely | | 10 | 3.8 |
| Individual perceived risk for cancer | | | |
| Mean: | 5.67 | | |
| Missing: | 4 | | |
| =0 Not likely at all | | 9 | 3.4 |
| 1 | | 16 | 6.1 |
| 2 | | 27 | 10.3 |

| | | | |
|---|---|---|---|
| 3 | | 21 | 8.0 |
| 4 | | 29 | 11.1 |
| 5 | | 68 | 26.1 |
| 6 | | 33 | 12.6 |
| 7 | | 32 | 12.3 |
| 8 | | 9 | 3.4 |
| =9 Extremely likely | | 13 | 5.0 |
| Prior exposure to skin cancer (Self) | | | |
| Missing: | 0 | | |
| Yes | | 11 | 4.2 |
| No | | 250 | 95.8 |
| Prior exposure to skin cancer (Family) | | | |
| Missing: | 1 | | |
| Yes | | 79 | 30.3 |
| No | | 162 | 62.1 |
| Don't Know | | | |
| Prior exposure to skin cancer (Friends & Acquaintances) | | | |
| Missing: | 0 | | |
| Yes | | 93 | 35.6 |
| No | | 143 | 54.8 |
| Don't Know | | 25 | 9.6 |

*Table 25 Demographics for Study 2 related to respondent's health status.*

| KNOWLEDGE OF ADVERSE OUTCOME & INVOLVEMENT CHECKS | | | |
|---|---|---|---|
| | | # OF PARTICIPANTS | PERCENTAGE |
| Knowledge of Adverse Outcome | | | |
| Missing: | 1 | | |
| Mean: | 3.57 | | |
| According to you, to what extent does the text about skin cancer that you just read contain new or known information? | | | |
| =1 Much known information | | 36 | 13.8 |
| 2 | | 58 | 22.2 |
| 3 | | 41 | 15.7 |
| 4 | | 34 | 13.0 |

| | | | |
|---|---|---|---|
| 5 | | 46 | 17.6 |
| 6 | | 27 | 10.3 |
| = 7 Much new information | | 18 | 6.9 |
| Missing: | 1 | | |
| Mean: | 6.17 | | |
| To what extent did you understand the information presented in the text about skin cancer that you just read? | | | |
| =1 Not at all | | 0 | |
| 2 | | 1 | .4 |
| 3 | | 1 | .4 |
| 4 | | 13 | 5.0 |
| 5 | | 39 | 14.9 |
| 6 | | 90 | 34.5 |
| =7 Fully | | 116 | 44.4 |
| Task Involvement | | | |
| Mean: | 13.44 | | |
| Missing: | 1 | | |
| When you were choosing the health insurance plan, to what extent were you:<br>• Involved<br>• Interested<br>• Putting effort | | | |
| Mean: | 6.02 | | |
| Missing: | 1 | | |
| When you were choosing the health insurance plan, to what extent were you making the decision as if you were really making it in real life? | | | |
| Not at all | | 2 | .8 |
| Very little | | 3 | 1.1 |
| A little | | 2 | .8 |
| Somewhat | | 18 | 6.9 |
| Moderately | | 43 | 16.5 |
| Very | | 80 | 30.7 |
| Extremely | | 112 | 42.9 |
| Knowledge of Adverse Outcome control involvement | | | |

| | | | |
|---|---|---|---|
| Missing: | 0 | | |
| Which of the following include skin cancer risk factors according to the text that you just read? | | | |
| 0/4 Answers Correct or 5/4 | | 14 | 5.4 |
| 1/4 Answer Correct | | 10 | 3.8 |
| 2/4 Answers Correct | | 44 | 16.9 |
| 3/4 Answers Correct | | 97 | 37.2 |
| 4/4 Answers Correct | | 96 | 36.8 |
| Perceived Risk manipulation involvement | | | |
| Missing: | 0 | | |
| What was the medical condition that your cousin suffered from in the scenario that you read?<br><br>What was the email about – that you were said to have received – in the scenario that you read? | | | |
| 0/2 Answers Correct | | 32 | 12.3 |
| 1/2 Answer Correct | | 104 | 39.8 |
| 2/2 Answers Correct | | 125 | 47.9 |

*Table 26 Knowledge of Adverse Outcome & Involvement checks for Study 2.*

5.3.2 Manipulation checks

Table 27 below demonstrates the methods used to check whether the manipulations of decision tools and perceived risk had a significant impact on the user: the price they paid for the health plan and their perceived health risk.

| EXPERIMENTAL MANIPULATION | | MANIPULATION CHECK | STATISTICAL TEST |
|---|---|---|---|
| Decision Tool: | • Non-compensatory Descending | Comparison of average price paid for item by users of each of the tools. | ANOVA |

| | | | |
|---|---|---|---|
| | • Non-compensatory Ascending<br>• Financial | | |
| High Perceived Risk | Comparison of average subjective probability of developing skin cancer as per scenario | Comparison of average subjective probability of developing skin cancer as per scenario | ANOVA |

*Table 27 Methods and statistical tests used for manipulation checks in Study 2.*

One-way ANOVA was carried out as a manipulation check to test the effects of NC Descending, NC Ascending, and Financial tools on user's decision quality. ANOVA tests differences among group means and assumes homogeneity of variance of the groups. Results for the analysis, as shown in Table 28, indicate that there is a significant effect of the three decision tools on decision quality (price paid) by the user: $F(2,257) = 42.106$, $p = .00000$. (Full analysis with post-hoc is provided below)

One-way ANOVA was carried out as a manipulation check to test the effects of the scenarios on user's perceived risk. Results for the analysis, as shown in Table 29, indicate that there is a significant effect of the scenarios on user's perceived risk: $F(1,257) = 66.818$, $p = .00000$. Means plot in Figure 20 below indicates that the perceived risk exhibited by users provided with High Perceived Risk scenario was significantly higher than that of users provided with Low Perceived Risk scenario.

| MANIPULATION CHECK – DECISION TOOLS | | | | | |
|---|---|---|---|---|---|
| ANOVA RESULT | | | | | |
| Dependent Variable: Price paid for the item | | | | | |
| Source: Decision Tool | | | | | |
| | Type III Sum of Squares | df | Mean Square | F | Sig. |
| Between Groups | 459369.663 | 2 | 229684.831 | 42.106 | .00000 |

| | | | | | |
|---|---|---|---|---|---|
| Within Groups | 1401909.079 | 257 | 5454.899 | | |
| Total | 1861278.741 | 259 | | | |

*Table 28 Manipulation check for Decision tools - Study 2.*

| MANIPULATION CHECK – PERCEIVED RISK | | | | | |
|---|---|---|---|---|---|
| ANOVA RESULT | | | | | |
| Dependent Variable: Perceived Risk | | | | | |
| Source: Scenario | | | | | |
| | Type III Sum of Squares | df | Mean Square | F | Sig. |
| Between Groups | 307.740 | 1 | 307.740 | 66.818 | .00000 |
| Within Groups | 1183.650 | 257 | 4.606 | | |
| Total | 1491.390 | 258 | | | |

*Table 29 Manipulation check for Perceived risk - Study 2.*

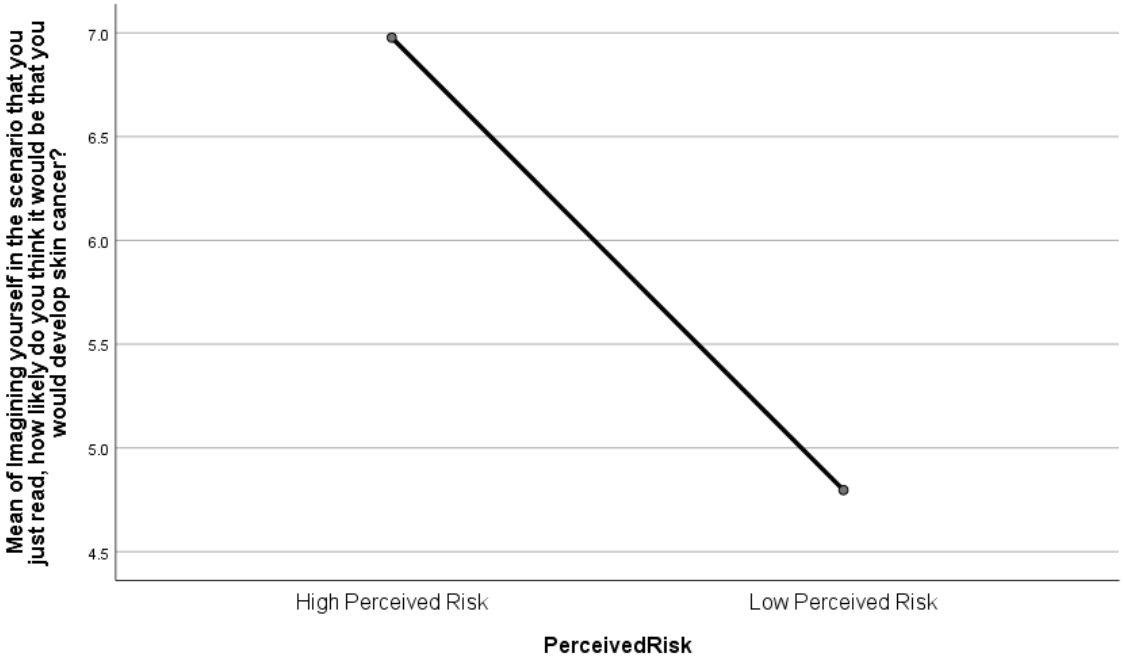



*Figure 20 Means plot for perceived risk - Study 2.*

### 5.3.3 Hypotheses testing

#### 5.3.3.1 ANOVA ANALYSIS FOR PRICE PAID

One-way ANOVA was carried out to test the effects of NC Descending, NC Ascending, and Financial tools on user's decision quality. Results for the analysis, as shown in Table

20, indicate that there is a significant effect of the three decision tools on decision quality (price paid) by the user: $F(2,257) = 42.106$, $p = .00000$. $\eta 2 = .2468$ indicates that the usage of the three decision tools explain around 24.7% of the variance in price paid by the user for a health plan.

Fully analysis is provided in Tables 30-35. Figure 21 below demonstrates the differences in mean prices paid across the decision tools.

| Descriptives | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Price Paid | | | | | | | | | | |
| | | | | | | 95% Confidence Interval for Mean | | | | |
| | | N | Mean | Std. Deviation | Std. Error | Lower Bound | Upper Bound | Minimum | Maximum | Between Component Variance |
| NC Descending | | 91 | 246.8132 | 69.53723 | 7.28948 | 232.3314 | 261.2950 | 80.00 | 335.00 | |
| NC Ascending | | 90 | 204.9667 | 77.88084 | 8.20936 | 188.6548 | 221.2785 | 59.00 | 335.00 | |
| Financial | | 79 | 142.8671 | 73.98006 | 8.32341 | 126.2965 | 159.4377 | 59.00 | 335.00 | |
| Total | | 260 | 200.7442 | 84.77266 | 5.25738 | 190.3916 | 211.0969 | 59.00 | 335.00 | |
| Model | Fixed Effects | | | 73.85729 | 4.58043 | 191.7243 | 209.7642 | | | |
| | Random Effects | | | | 29.80778 | 72.4917 | 328.9967 | | | 2592.3688 |

*Table 30 Descriptives for ANOVA in Study 2.*

| Test of Homogeneity of Variances | | | | | |
|---|---|---|---|---|---|
| | | Levene Statistic | df1 | df2 | Sig. |
| Price Paid | Based on Mean | .360 | 2 | 257 | .698 |
| | Based on Median | .900 | 2 | 257 | .408 |
| | Based on Median and with adjusted df | .900 | 2 | 226.702 | .408 |
| | Based on trimmed mean | .838 | 2 | 257 | .434 |

*Table 31 Homogeneity of variances test in Study 2.*

| ANOVA RESULTS (DV: Price Paid) | | | | | | |
|---|---|---|---|---|---|---|
| Source | Type III Sum of Squares | df | Mean Square | F | Sig. | Eta Squared |
| Between Groups | 459369.663 | 2 | 229684.831 | 42.106 | .00000 | .24680 |
| Within Groups | 1401909.079 | 257 | 5454.899 | | | |
| Total | 1861278.741 | 259 | | | | |

*Table 32 ANOVA result: effects of decision tools on decision quality for Study 2.*

| Robust Tests of Equality of Means | | | | |
|---|---|---|---|---|
| Price Paid | | | | |
| | Statistic[a] | df1 | df2 | Sig. |
| Welch | 44.013 | 2 | 169.117 | .000 |
| Brown-Forsythe | 42.071 | 2 | 252.276 | .000 |
| a. Asymptotically F distributed | | | | |

*Table 33 Equality of means tests for Study 2.*

| Multiple Comparisons | | | | | | | |
|---|---|---|---|---|---|---|---|
| Dependent Variable: Price Paid | | | | | | | |
| | | | | | | 95% Confidence Interval | |
| | (I) Decision Tool | (J) Decision Tool | Mean Difference (I-J) | Std. Error | Sig. | Lower Bound | Upper Bound |
| Tukey HSD | NC Descending | NC Ascending | 41.84652* | 10.97971 | .00050651 | 15.9632 | 67.7298 |
| | | Financial | 103.9461* | 11.35752 | .00000001 | 77.1722 | 130.7200 |
| | NC Ascending | NC Descending | -41.84652* | 10.97971 | .00050651 | -67.7298 | -15.9632 |
| | | Financial | 62.09958* | 11.38681 | .00000035 | 35.2566 | 88.9425 |
| | Financial | NC Descending | -103.946* | 11.35752 | .00000001 | -130.7200 | -77.1722 |
| | | NC Ascending | -62.09958* | 11.38681 | .00000035 | -88.9425 | -35.2566 |
| Scheffe | NC Descending | NC Ascending | 41.84652* | 10.97971 | .00085447 | 14.8136 | 68.8795 |
| | | Financial | 103.9461* | 11.35752 | .00000000 | 75.9829 | 131.9093 |
| | NC Ascending | NC Descending | -41.84652* | 10.97971 | .00085447 | -68.8795 | -14.8136 |
| | | Financial | 62.09958* | 11.38681 | .00000077 | 34.0643 | 90.1348 |
| | Financial | NC Descending | -103.946* | 11.35752 | .00000000 | -131.9093 | -75.9829 |
| | | NC Ascending | -62.09958* | 11.38681 | .00000077 | -90.1348 | -34.0643 |
| * The main difference is significant at the .05 level | | | | | | | |

*Table 34 Multiple comparisons across decision tools in Study 2.*

| Price Paid | | | | | |
|---|---|---|---|---|---|
| | | | | | Subset for alpha = .05 |
| | Decision Tool | N | 1 | 2 | 3 |
| Tukey HSD[a,b] | Financial | 79 | 142.8671 | | |
| | NC Ascending | 90 | | 204.9667 | |
| | NC Descending | 91 | | | 246.8132 |
| | Sig. | | 1.000 | 1.000 | 1.000 |
| Scheffe[a,b] | Financial | 79 | 142.8671 | | |
| | NC Ascending | 90 | | 204.9667 | |
| | NC Descending | 91 | | | 246.8132 |
| | Sig. | | 1.000 | 1.000 | 1.000 |

Means for groups in homogenous subsets are displayed.
a. Uses Harmonic Mean Sample Size = 86.310.
b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

*Table 35 Homogeneous subsets in Study 2.*

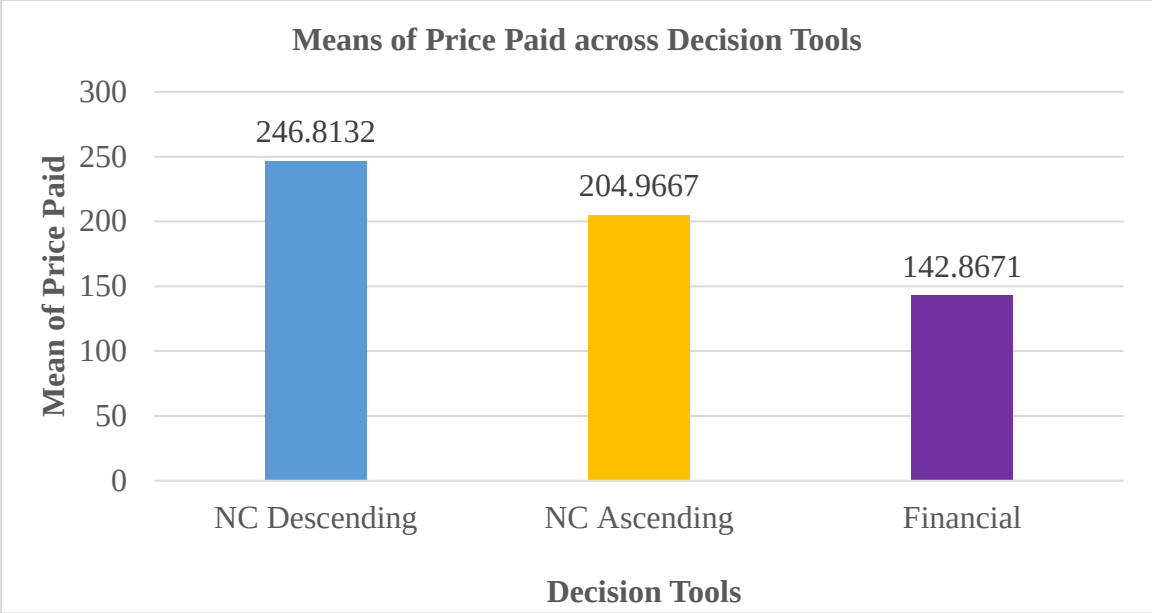



*Figure 21 Means of price paid across the decision tools in Study 2.*

5.3.3.2 PERCEIVED RISK MODERATION ANALYSIS

ANCOVA was carried out to test whether perceived risk moderates the effects of NC Descending, NC Ascending, and Financial tools on user's decision quality. Results for the analysis, as shown in Table 36 below, indicate that there is a significant interaction between the decision tools and user's perceived risk: $F(3, 256) = 42.448$, $p = .00000$. $R^2 = .332$ indicates that the usage of the three decision tools and user's perceived risk explain about 33.2 % of the variance in price paid by the user for a health plan.

The interaction plot shown in Figure 23 further below, indicates that prices paid are higher when making purchase choices with the three decision tools when users are under high perceived risk than when they are under low perceived risk. Post hoc analysis further below delineates these results in detail.

Full analysis is provided below in Tables 36-44 and Figure 22.

| ANCOVA RESULTS (DV: Price Paid) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Source | Type III Sum of Squares | df | Mean Square | F | Sig. | Partial Eta Squared | Observed Power[b] |
| Corrected Model | 618302.832[a] | 3 | 206100.944 | 42.448 | .00000 | .332 | 1.000 |
| Intercept | 2251528.477 | 1 | 2251528.477 | 463.719 | .00000 | .644 | 1.000 |
| Decision Tool * Perceived Risk | 618302.832 | 3 | 206100.944 | 42.448 | .00000 | .332 | 1.000 |
| Error | 1242975.909 | 256 | 4855.375 | | | | |
| Total | 12338822.75 | 260 | | | | | |
| Corrected Total | 1861278.741 | 259 | | | | | |
| | | | | | | | |
| [a] $R^2$ = .332 (Adjusted $R^2$ = .324) | | | | | | | |
| [b] Computed using alpha = .05 | | | | | | | |

*Table 36 ANCOVA results for Study 2 with perceived risk moderation.*

| Between-Subjects Factors | | | |
|---|---|---|---|
| | | Value Label | N |
| Decision Tool | 4.00 | NC Descending | 91 |
| | 5.00 | NC Ascending | 90 |
| | 6.00 | Financial | 79 |

*Table 37 Between-subjects factors for ANCOVA with perceived risk.*

| Descriptives | | | |
|---|---|---|---|
| Price Paid | | | |
| Decision Tool | Mean | Std. Deviation | N |
| NC Descending | 246.8132 | 69.53723 | 91 |
| NC Ascending | 204.9667 | 77.88084 | 90 |
| Financial | 142.8671 | 73.98006 | 79 |
| Total | 200.7442 | 84.77266 | 260 |

*Table 38 Descriptives for ANCOVA with perceived risk.*

| Levene's Test of Equality of Error Variances[a] | | | |
|---|---|---|---|
| Dependent Variable: Price Paid | | | |
| F | df1 | df2 | Sig. |
| .546 | 2 | 257 | .580 |
| Tests the null hypothesis that the error variance of the dependent variable is equal across groups. | | | |
| a. Design: Intercept + Decision Tool*Perceived Risk | | | |

*Table 39 Levene's test for ANCOVA with perceived risk.*

| White Test for Heteroskedasticity[a,b,c] | | |
|---|---|---|
| Chi-Square | df | Sig. |
| 2.698 | 3 | .441 |
| a. Dependent variable: Price Paid | | |
| b. Tests the null hypothesis that the variance of the errors does not depend on the values of the independent variables. | | |
| c. Design: Intercept + Decision Tool*Perceived Risk | | |

*Table 40 White test for heteroskedaticity for ANCOVA with perceived risk.*

| F Test for Heteroskedasticity[a,b,c] | | | |
|---|---|---|---|
| F | df1 | df2 | Sig. |
| .895 | 3 | 256 | .444 |
| a. Dependent variable: Price Paid | | | |
| b. Tests the null hypothesis that the variance of the errors does not depend on the values of the independent variables. | | | |
| c. Design: Intercept + Decision Tool*Perceived Risk | | | |

*Table 41 F test for heteroskedasticity for ANCOVA with perceived risk.*

| Estimates | | | | |
|---|---|---|---|---|
| Dependent Variable: Price Paid | | | | |
| | | | 95% Confidence Interval | |
| Decision Tool | Mean | Std. Error | Lower Bound | Upper Bound |
| NC Descending | 239.159[a] | 7.154 | 225.071 | 253.248 |
| NC Ascending | 205.674[a] | 7.018 | 191.853 | 219.495 |
| Financial | 151.722[a] | 7.555 | 136.844 | 166.601 |
| a. Covariates appearing in the model are evaluated at the following values: Perceived Risk = 1.4923 | | | | |

*Table 42 Estimates for ANCOVA with perceived risk.*

| Pairwise Comparisons | | | | | | |
|---|---|---|---|---|---|---|
| Dependent Variable:<br>Price Paid | | | | | | |
| | | | | | 95% Confidence Interval[b] | |
| (I) Decision Tool | (J) Decision Tool | Mean Difference (I-J) | Std. Error | Sig.[b] | Lower Bound | Upper Bound |
| NC Descending | NC Ascending | 33.486* | 9.839 | .00077213 | 14.110 | 52.861 |
| | Financial | 87.437* | 10.249 | .00000000 | 67.253 | 107.620 |
| NC Ascending | NC Descending | -33.486* | 9.839 | .00077213 | -52.861 | -14.110 |
| | Financial | 53.951* | 10.100 | .00000020 | 34.062 | 73.841 |
| Financial | NC Descending | -87.437* | 10.249 | .00000000 | -107.620 | -67.253 |
| | NC Ascending | -53.951* | 10.100 | .00000020 | -73.841 | -34.062 |
| Based on estimated marginal means<br>* The main difference is significant at the .05 level.<br>b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments). | | | | | | |

*Table 43 Pairwise comparisons for ANCOVA with perceived risk.*

| Univariate Tests | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Dependent Variable: Price Paid | | | | | | | | |
| | Sum of Squares | df | Mean Square | F | Sig. | Partial Eta Squared | Noncent. Parameter | Observed Power[a] |
| Contrast | 357696.88 | 2 | 178848.44 | 36.835 | .00000000 | .223 | 73.670 | 1.000 |
| Error | 1242975.9 | 256 | 4855.375 | | | | | |
| The F tests the effect of Decision Tool. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.<br>a. Computed using alpha = .05 | | | | | | | | |

*Table 44 Univariate tests for ANCOVA with perceived risk.*

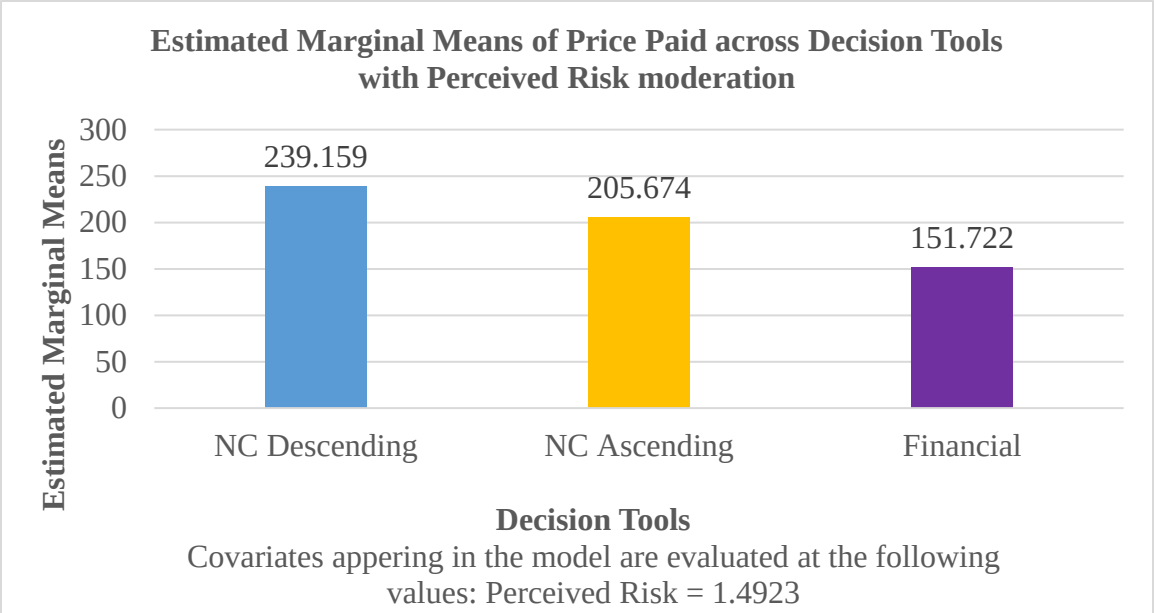



*Figure 22 Estimated marginal means of price paid for ANCOVA with perceived risk.*

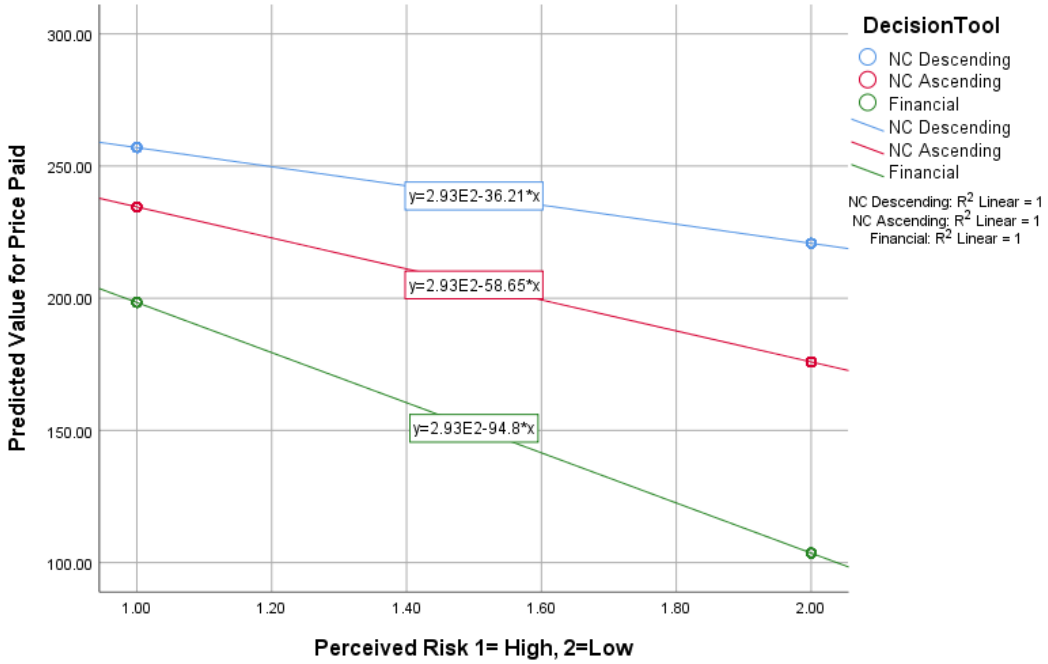



*Figure 23 Interaction plot for decision tools and user's perceived risk.*

## POST HOC ANALYSIS FOR PERCEIVED RISK

After carrying out ANCOVA to test the moderating effect of perceived risk on user's decision quality, the dataset was split by perceived risk and ANOVA was carried out in each subset as post-hoc to examine the effect of the decision tools for each level of perceived risk.

Post-hoc analysis shows that means of prices paid are higher under high than under low perceived risk (significantly higher for NC Descending p=.00000 and NC Ascending tools p=.00010).

For each group, there are significant differences for price paid across the decision tools under high perceived risk and there is no significant difference across price paid between NC Descending and Ascending under low perceived risk.

## HIGH PERCEIVED RISK

One-way ANOVA was carried out to test the effects of NC Descending, NC Ascending, and Financial tools on user's decision quality for users under high perceived risk. Results for the analysis, as shown in Table 47, indicate that there is a significant effect of the three decision tools on decision quality (price paid) of the user: $F(2,129) = 32.940$, $p = .00000$. $\eta^2 = .338$ indicates that the usage of the three decision tools explain around 33.8 % of the variance in price paid for a health plan by the user when in circumstances of high perceived risk.

Under high perceived risk, the price paid for a health plan by the users when making the purchase choice with NC Descending tool is significantly higher from price paid when making the decision with NC Ascending tool: $M = 281.276$ vs. $M = 238.93$, $p = .00984$.

The price paid with NC Descending tool is also significantly higher from price paid using Financial tool: M = 281.276 vs. M = 163.9250, p = .00000.

Furthermore, under high perceived risk, the price paid for a health plan by the users, when making the purchase choice with NC Ascending tool, is significantly higher from price paid when making the choice with the Financial tool: M = 238.9302 vs. M = 163.9250, p = .00001. Full analysis is provided in Tables 45-50 and Figure 24 below.

| Descriptives | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Price Paid | | | | | | | | | | |
| | | | | | | 95% Confidence Interval for Mean | | | | |
| | | N | Mean | Std. Deviation | Std. Error | Lower Bound | Upper Bound | Minimum | Maximum | Between Component Variance |
| NC Descending | | 49 | 281.2755 | 56.69298 | 8.09900 | 264.9914 | 297.5596 | 132.50 | 335.00 | |
| NC Ascending | | 43 | 238.9302 | 71.68454 | 10.93179 | 216.8690 | 260.9915 | 59.00 | 335.00 | |
| Financial | | 40 | 163.9250 | 76.77586 | 12.13933 | 139.3709 | 188.4791 | 59.00 | 335.00 | |
| Total | | 132 | 231.9205 | 83.18084 | 7.23996 | 217.5981 | 246.2428 | 59.00 | 335.00 | |
| Model | Fixed Effects | | | 68.19873 | 5.93594 | 220.1761 | 243.6649 | | | |
| | Random Effects | | | | 34.24747 | 84.5655 | 379.2754 | | | 3388.4583 |

*Table 45 Descriptives in high perceived risk condition.*

| Test of Homogeneity of Variances | | | | | |
|---|---|---|---|---|---|
| | | Levene Statistic | df1 | df2 | Sig. |
| Price Paid | Based on Mean | 1.987 | 2 | 129 | .141 |
| | Based on Median | .674 | 2 | 129 | .511 |
| | Based on Median and with adjusted df | .674 | 2 | 113.100 | .512 |
| | Based on trimmed mean | 1.937 | 2 | 129 | .148 |

*Table 46 Homogeneity of variance test in high perceived risk condition.*

| ANOVA RESULTS (DV: Price Paid) | | | | | | |
|---|---|---|---|---|---|---|
| Source | Sum of Squares | df | Mean Square | F | Sig. | Eta Squared |
| Between Groups | 306408.318 | 2 | 153204.159 | 32.940 | .00000 | .338 |
| Within Groups | 599987.596 | 129 | 4651.067 | | | |
| Total | 906395.915 | 131 | | | | |

*Table 47 ANOVA result for users under high perceived risk.*

| Robust Tests of Equality of Means | | | | |
|---|---|---|---|---|
| Price Paid | | | | |
| | Statistic[a] | df1 | df2 | Sig. |
| Welch | 32.183 | 2 | 80.433 | .00000000 |
| Brown-Forsythe | 31.937 | 2 | 114.529 | .00000000 |
| a. Asymptotically F distributed | | | | |

*Table 48 Equality of means tests for ANOVA in high perceived risk condition.*

| Multiple Comparisons | | | | | | | |
|---|---|---|---|---|---|---|---|
| Dependent Variable: Price Paid | | | | | | | |
| | | | | | | 95% Confidence Interval | |
| | (I) Decision Tool | (J) Decision Tool | Mean Difference (I-J) | Std. Error | Sig. | Lower Bound | Upper Bound |
| Tukey HSD | NC Descending | NC Ascending | 42.34528* | 14.25076 | .00983500 | 8.5557 | 76.1349 |
| | | Financial | 117.3505* | 14.53260 | .00000001 | 82.8926 | 151.8084 |
| | NC Ascending | NC Descending | -42.34528* | 14.25076 | .00983500 | -76.1349 | -8.5557 |
| | | Financial | 75.00523* | 14.98136 | .00000531 | 39.4833 | 110.5271 |
| | Financial | NC Descending | -117.351* | 14.53260 | .00000001 | -151.8084 | -82.8926 |
| | | NC Ascending | -75.00523* | 14.98136 | .00000531 | -110.5271 | -39.4833 |
| Scheffe | NC Descending | NC Ascending | 42.34528* | 14.25076 | .01397893 | 7.0541 | 77.6365 |
| | | Financial | 117.3505* | 14.53260 | .00000000 | 81.3613 | 153.3397 |
| | NC Ascending | NC Descending | -42.34528* | 14.25076 | .01397893 | -77.6365 | -7.0541 |
| | | Financial | 75.00523* | 14.98136 | .00001062 | 37.9047 | 112.1057 |
| | Financial | NC Descending | -117.351* | 14.53260 | .00000000 | -153.3397 | -81.3613 |
| | | NC Ascending | -75.00523* | 14.98136 | .00001062 | -112.1057 | -37.9047 |
| * The main difference is significant at the .05 level | | | | | | | |

*Table 49 Multiple comparisons for ANOVA in high perceived risk condition.*

| Price Paid | | | | | |
|---|---|---|---|---|---|
| | | | | | Subset for alpha = .05 |
| | Decision Tool | N | 1 | 2 | 3 |
| Tukey HSD[a,b] | Financial | 40 | 163.9250 | | |
| | NC Ascending | 43 | | 238.9302 | |
| | NC Descending | 49 | | | 281.2755 |
| | Sig. | | 1.000 | 1.000 | 1.000 |
| Scheffe[a,b] | Financial | 40 | 163.9250 | | |
| | NC Ascending | 43 | | 238.9302 | |
| | NC Descending | 49 | | | 281.2755 |
| | Sig. | | 1.000 | 1.000 | 1.000 |

Means for groups in homogenous subsets are displayed.
a. Uses Harmonic Mean Sample Size = 43.691.
b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

*Table 50 Homogenous subsets for ANOVA in high perceived risk condition.*

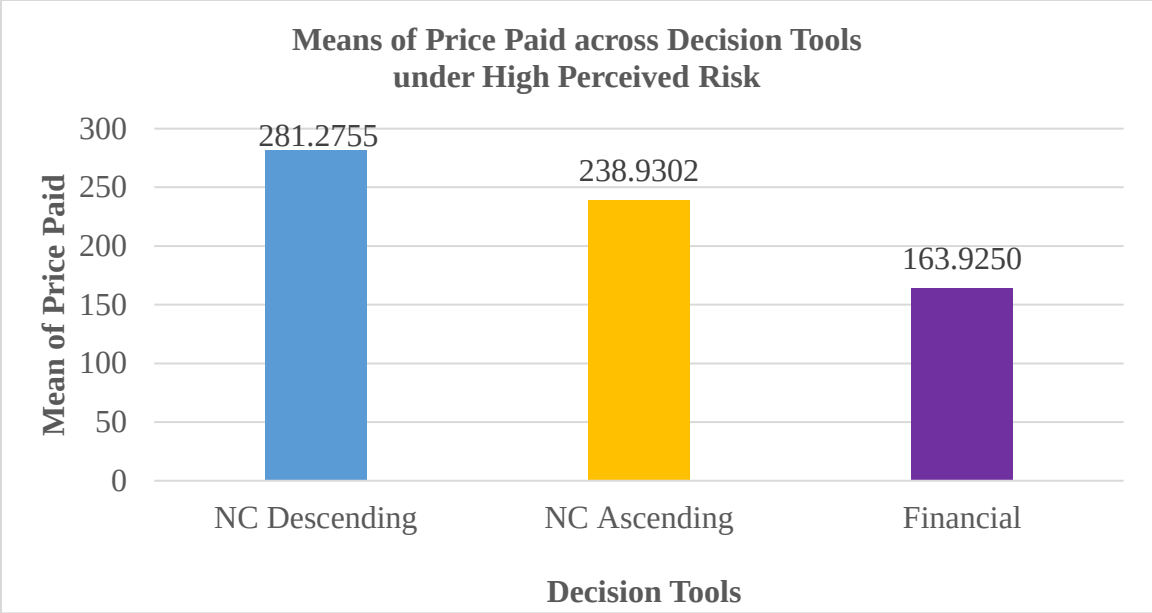



*Figure 24 Means of price paid across decision tools in high perceived risk condition.*

LOW PERCEIVED RISK

One-way ANOVA was carried out to test the effects of NC Descending, NC Ascending, and Financial tools on user's decision quality for users under low perceived risk. Results for the analysis, as shown in Table 53, indicate that there is a significant effect of the three decision tools on decision quality (price paid) of the user: F (2,125) = 17.130, p = .00000. $\eta^2$ = .215 indicates that the usage of the three decision tools explain around 21.5 % of the variance in price paid for a health plan by the user when in circumstances of low perceived risk.

The price paid with NC Descending tool is significantly higher from price paid using Financial tool: M = 206.6071 vs. M = 173.8936, p = .00000. Furthermore, under low perceived risk, the price paid for a health plan by the users, when making the purchase choice with NC Ascending tool, is significantly higher from price paid when making the choice with the Financial tool: M = 173.8936 vs. M = 121.2692, p = .00100.

However, under low perceived risk, the price paid for a health plan by the users when making the purchase choice with NC Descending tool is not significantly higher from price paid when making the decision with NC Ascending tool: M = 206.6071 vs. M = 173.8936, p = .054898.

Full analysis is provided below in Tables 51-56 and Figure 25.

| Descriptives | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Price Paid | | | | | | | | | | |
| | | | | | | 95% Confidence Interval for Mean | | | | |
| | | N | Mean | Std. Deviation | Std. Error | Lower Bound | Upper Bound | Minimum | Maximum | Between Component Variance |
| NC Descending | | 42 | 206.6071 | 61.45051 | 9.48202 | 187.4578 | 225.7565 | 80.00 | 335.00 | |
| NC Ascending | | 47 | 173.8936 | 70.55941 | 10.29215 | 153.1766 | 194.6106 | 59.000 | 335.00 | |
| Financial | | 39 | 121.2692 | 65.10749 | 10.42554 | 100.1638 | 142.3746 | 59.00 | 335.00 | |
| Total | | 128 | 168.5938 | 73.93745 | 6.53521 | 155.6618 | 181.5257 | 59.00 | 335.00 | |
| Model | Fixed Effects | | | 66.02552 | 5.83589 | 157.0438 | 180.1437 | | | |
| | Random Effects | | | | 24.25623 | 64.2276 | 272.9599 | | | 1653.0333 |

*Table 51 Descriptives in low perceived risk condition.*

| Test of Homogeneity of Variances | | | | | |
|---|---|---|---|---|---|
| | | Levene Statistic | df1 | df2 | Sig. |
| Price Paid | Based on Mean | .900 | 2 | 125 | .409 |
| | Based on Median | .431 | 2 | 125 | .651 |
| | Based on Median and with adjusted df | .431 | 2 | 115.475 | .651 |
| | Based on trimmed mean | 1.004 | 2 | 125 | .369 |

*Table 52 Homogeneity of variance test in low perceived risk condition.*

| ANOVA RESULTS (DV: Price Paid) | | | | | | |
|---|---|---|---|---|---|---|
| Source | Sum of Squares | df | Mean Square | F | Sig. | Eta Squared |
| Between Groups | 149355.716 | 2 | 74677.858 | 17.130 | .00000 | .215 |
| Within Groups | 544921.159 | 125 | 4359.369 | | | |
| Total | 694276.875 | 127 | | | | |

*Table 53 ANOVA result for users under low perceived risk.*

| Robust Tests of Equality of Means | | | | |
|---|---|---|---|---|
| Price Paid | | | | |
| | Statistic[a] | df1 | df2 | Sig. |
| Welch | 18.300 | 2 | 82.652 | .00000026 |
| Brown-Forsythe | 17.296 | 2 | 123.987 | .00000024 |
| a. Asymptotically F distributed | | | | |

*Table 54 Equality of means test for ANOVA in low perceived risk condition.*

| Multiple Comparisons | | | | | | | |
|---|---|---|---|---|---|---|---|
| Dependent Variable: Price Paid | | | | | | | |
| | | | | | | 95% Confidence Interval | |
| | (I) Decision Tool | (J) Decision Tool | Mean Difference (I-J) | Std. Error | Sig. | Lower Bound | Upper Bound |
| Tukey HSD | NC Descending | NC Ascending | 32.71353 | 14.01952 | .05489839 | -.5402 | 65.9673 |
| | | Financial | 85.33791* | 14.68241 | .00000015 | 50.5118 | 120.1640 |
| | NC Ascending | NC Descending | -32.71353 | 14.01952 | .05489839 | -65.9673 | .5402 |
| | | Financial | 52.62439* | 14.30144 | .00100198 | 18.7020 | 86.5468 |
| | Financial | NC Descending | -85.33791* | 14.68241 | .00000015 | -120.1640 | -50.5118 |
| | | NC Ascending | -52.62439* | 14.30144 | .00100198 | -86.5468 | -18.7020 |
| Scheffe | NC Descending | NC Ascending | 32.71353 | 14.01952 | .06961235 | -2.0181 | 67.4451 |
| | | Financial | 85.33791* | 14.68241 | .00000032 | 48.9641 | 121.7117 |
| | NC Ascending | NC Descending | -32.71353 | 14.01952 | .06961235 | -67.4451 | 2.0181 |
| | | Financial | 52.62439* | 14.30144 | .00161604 | 17.1944 | 88.0544 |
| | Financial | NC Descending | -85.33791* | 14.68241 | .00000032 | -121.7117 | -48.9641 |
| | | NC Ascending | -52.62439* | 14.30144 | .00161604 | -88.0544 | -17.1944 |
| * The main difference is significant at the .05 level | | | | | | | |

*Table 55 Multiple comparisons for ANOVA in low perceived risk condition.*

| Price Paid | | | | | |
|---|---|---|---|---|---|
| | | | | | Subset for alpha = .05 |
| | Decision Tool | N | 1 | 2 | 3 |
| Tukey HSD[a,b] | Financial | 39 | 121.2692 | | |
| | NC Ascending | 47 | | 173.8936 | |
| | NC Descending | 42 | | 206.6071 | |
| | Sig. | | 1.00 | .062 | |
| Scheffe[a,b] | Financial | 39 | 121.2692 | | |
| | NC Ascending | 47 | | 173.8936 | |
| | NC Descending | 42 | | 206.6071 | |
| | Sig. | | 1.000 | .078 | |

Means for groups in homogenous subsets are displayed.
a. Uses Harmonic Mean Sample Size = 42.417.
b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

*Table 56 Homogeneous subsets in low perceived risk condition.*

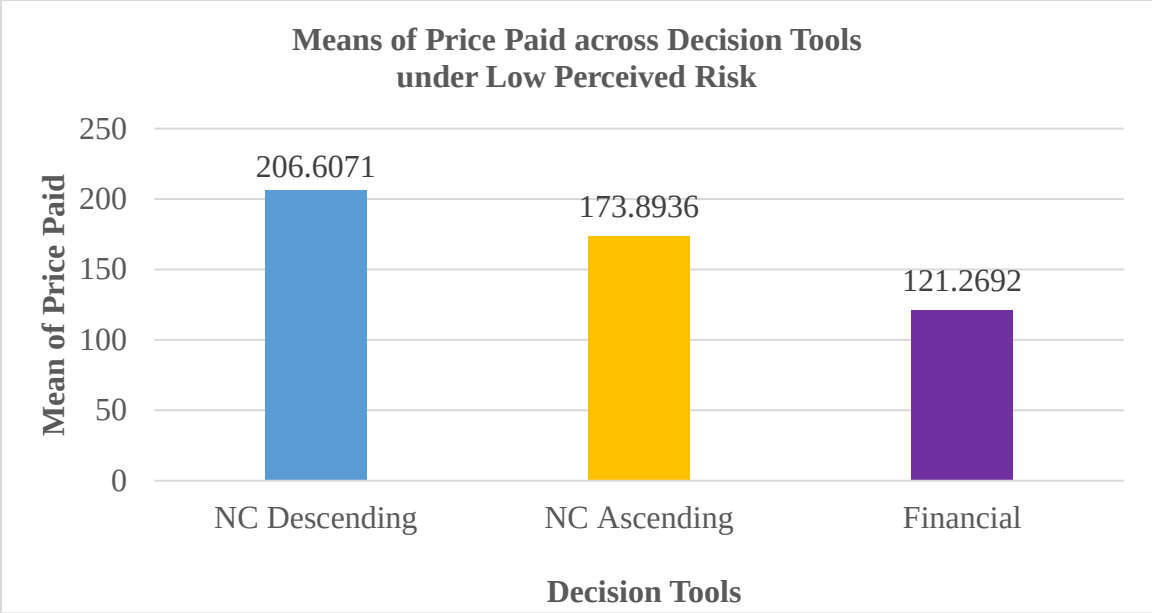



*Figure 25 Means of prices paid across decision tools in low perceived risk condition.*

DECISION TOOLS AND PERCEIVED RISK

An additional analysis was executed to examine the differences across prices paid using the three decision tools and perceived risk. The data were recoded to account for both decision tool and perceived risk group assignment and ANOVA was carried out to check price mean differences across the groups.

Results for the analysis, as shown in Table 59 below, indicate that there is a significant interaction between the decision tools and user's perceived risk: $F(5, 254) = 31.786$, $p = .00000$.

Prices paid using the three decision tools by users under high perceived risk were higher than prices paid by users under low perceived risk.

The price paid using NC Descending tool was significantly higher under high than under low perceived risk (NC Descending HPR vs LPR p=.00000).

The price paid using NC Ascending tool was also significantly higher under high than under low perceived risk (NC Ascending HPR vs LPR p =.00010).

There was no significant difference across price paid using the Financial tool under high vs. under low perceived risk.

Interestingly, there was no significant difference across prices paid using NC Descending and under low perceived risk vs. NC Ascending tools and users under high perceived risk.

Full analysis is provided in tables 57-62 and Figure 26 below.

| Descriptives | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Price Paid | | | | | | | | | | |
| | | | | | | 95% Confidence Interval for Mean | | | | |
| | | N | Mean | Std. Deviation | Std. Error | Lower Bound | Upper Bound | Minimum | Maximum | Between Component Variance |
| NC Descending & HPR | | 49 | 281.2755 | 56.69298 | 8.09900 | 264.9914 | 297.5596 | 132.50 | 335.00 | |
| NC Descending & LPR | | 42 | 206.6071 | 61.45051 | 9.48202 | 187.4578 | 225.7565 | 80.00 | 335.00 | |
| NC Ascending & HPR | | 43 | 238.9302 | 71.68454 | 10.93179 | 216.8690 | 260.9915 | 59.00 | 335.00 | |
| NC Ascending & LPR | | 47 | 173.8936 | 70.55941 | 10.29215 | 153.1766 | 194.6106 | 59.00 | 335.00 | |
| Financial & HPR | | 40 | 163.9250 | 76.77586 | 12.13933 | 139.3709 | 188.4791 | 59.00 | 335.00 | |
| Financial & LPR | | 39 | 121.2692 | 65.10749 | 10.42554 | 100.1638 | 142.3746 | 59.00 | 335.00 | |
| Total | | 260 | 200.7442 | 84.77266 | 5.25738 | 190.3916 | 211.0969 | 59.00 | 335.00 | |
| Model | Fixed Effects | | | 67.13803 | 4.16372 | 192.5444 | 208.9440 | | | |
| | Random Effects | | | | 23.56811 | 140.1605 | 261.3280 | | | 3206.7055 |

*Table 57 Descriptives for data grouped by decision tool * perceived risk.*

| Test of Homogeneity of Variances | | | | | |
|---|---|---|---|---|---|
| | | Levene Statistic | df1 | df2 | Sig. |
| Price Paid | Based on Mean | 1.493 | 5 | 254 | .192 |
| | Based on Median | .601 | 5 | 254 | .699 |
| | Based on Median and with adjusted df | .601 | 5 | 228.260 | .699 |
| | Based on trimmed mean | 1.487 | 5 | 254 | .194 |

*Table 58 Homogeneity of variance test for ANOVA - data grouped by decision tool * perceived risk.*

| ANOVA RESULTS (DV: Price Paid) | | | | | |
|---|---|---|---|---|---|
| Source | Sum of Squares | df | Mean Square | F | Sig. |
| Between Groups | 716369.986 | 5 | 143273.997 | 31.786 | .00000 |
| Within Groups | 1144908.755 | 254 | 4507.515 | | |
| Total | 1861278.741 | 259 | | | |

*Table 59 ANOVA result for data grouped by decision tool * perceived risk.*

| Robust Tests of Equality of Means | | | | |
|---|---|---|---|---|
| Price Paid | | | | |
| | Statistic[a] | df1 | df2 | Sig. |
| Welch | 35.821 | 5 | 116.687 | .00000000 |
| Brown-Forsythe | 31.513 | 5 | 238.659 | .00000000 |
| a. Asymptotically F distributed | | | | |

*Table 60 Equality of means tests - data grouped by decision tool * perceived risk.*

| Multiple Comparisons | | | | | | | |
|---|---|---|---|---|---|---|---|
| Dependent Variable: Price Paid | | | | | | | |
| | | | | | | 95% Confidence Interval | |
| | (I) Decision Tool | (J) Decision Tool | Mean Difference (I-J) | Std. Error | Sig. | Lower Bound | Upper Bound |
| Scheffe | NC Descending & HPR | NC Descending & LPR | 74.66837* | 14.11779 | .0000654780 | 27.3205 | 122.0163 |
| | | NC Ascending & HPR | 42.34528 | 14.02911 | .1089186917 | -4.7052 | 89.3958 |
| | | NC Ascending & LPR | 107.38189* | 13.70747 | .0000000001 | 61.4101 | 153.3537 |
| | | Financial & HPR | 117.35051* | 14.30657 | .0000000000 | 69.3695 | 165.3315 |
| | | Financial & LPR | 160.00628* | 14.40720 | .0000000000 | 111.6878 | 208.3248 |
| | NC Descending & LPR | NC Descending & HPR | -74.66837* | 14.11779 | .0000654780 | -122.0163 | -27.3205 |
| | | NC Ascending & HPR | -32.32309 | 14.56529 | .4274167184 | -81.1718 | 16.5256 |
| | | NC Ascending & LPR | 32.71353 | 14.25575 | .3869800078 | -15.0971 | 80.5241 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | Financial & HPR | 42.68214 | 14.83272 | .1457509343 | -7.0635 | 92.4278 |
| | | Financial & LPR | 85.33791* | 14.92981 | .0000097390 | 35.2667 | 135.4091 |
| | NC Ascending & HPR | NC Descending & HPR | -42.34528 | 14.02911 | .1089186917 | -89.3958 | 4.7052 |
| | | NC Descending & LPR | 32.32309 | 14.56529 | .4274167184 | -16.5256 | 81.1718 |
| | | NC Ascending & LPR | 65.03662* | 14.16794 | .0010686621 | 17.5205 | 112.5527 |
| | | Financial & HPR | 75.00523* | 14.74835 | .0001540371 | 25.5426 | 124.4679 |
| | | Financial & LPR | 117.66100* | 14.84598 | .0000000001 | 67.8709 | 167.4511 |
| | NC Ascending & LPR | NC Descending & HPR | -107.38189* | 13.70747 | .0000000001 | -153.3537 | -61.4101 |
| | | NC Descending & LPR | -32.71353 | 14.25575 | .3869800078 | -80.5241 | 15.0971 |
| | | NC Ascending & HPR | -65.03662* | 14.16794 | .0010686621 | -112.5527 | -17.5205 |
| | | Financial & HPR | 9.96862 | 14.44273 | .9928804826 | -38.4691 | 58.4063 |
| | | Financial & LPR | 52.62439* | 14.54242 | .0248913241 | 3.8524 | 101.3964 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Financial & HPR | NC Descending & HPR | -117.35051* | 14.30657 | .0000000000 | -165.3315 | -69.3695 |
| | | NC Descending & LPR | -42.68214 | 14.83272 | .1457509343 | -92.4278 | 7.0635 |
| | | NC Ascending & HPR | -75.00523* | 14.74835 | .0001540371 | -124.4679 | -25.5426 |
| | | NC Ascending & LPR | -9.96862 | 14.44273 | .9928804826 | -58.4063 | 38.4691 |
| | | Financial & LPR | 42.65577 | 15.10845 | .1621372683 | -8.0146 | 93.3261 |
| | Financial & LPR | NC Descending & HPR | -160.00628* | 14.40720 | .0000000000 | -208.3248 | -111.6878 |
| | | NC Descending & LPR | -85.33791* | 14.92981 | .0000097390 | -135.4091 | -35.2667 |
| | | NC Ascending & HPR | -117.66100* | 14.84598 | .0000000001 | -167.4511 | -67.8709 |
| | | NC Ascending & LPR | -52.62439* | 14.54242 | .0248913241 | -101.3964 | -3.8524 |
| | | Financial & HPR | -42.65577 | 15.10845 | .1621372683 | -93.3261 | 8.0146 |
| * The main difference is significant at the .05 level | | | | | | | |

*Table 61 Multiple comparisons for ANOVA for data grouped by decision tool * perceived risk.*

| Price Paid | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | Subset for alpha = .05 | | | | |
| | Decision Tool | N | 1 | 2 | 3 | 4 | 5 |
| Tukey HSD[a,b] | Financial & LPR | 39 | 121.2692 | | | | |
| | Financial & HPR | 40 | | 163.9250 | | | |
| | NC Ascending & LPR | 47 | | 173.8936 | 173.8936 | | |
| | NC Descending & LPR | 42 | | | 238.9302 | 206.6071 | |
| | NC Ascending & HPR | 43 | | | | 238.9302 | |
| | NC Descending & HPR | 49 | | | | | 281.2755 |
| | Sig. | | 1.000 | .983 | .214 | .226 | 1.000 |

Means for groups in homogenous subsets are displayed.
a. Uses Harmonic Mean Sample Size = 43.044.
b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

*Table 62 Homogeneous subsets for data grouped by decision tool * perceived risk.*

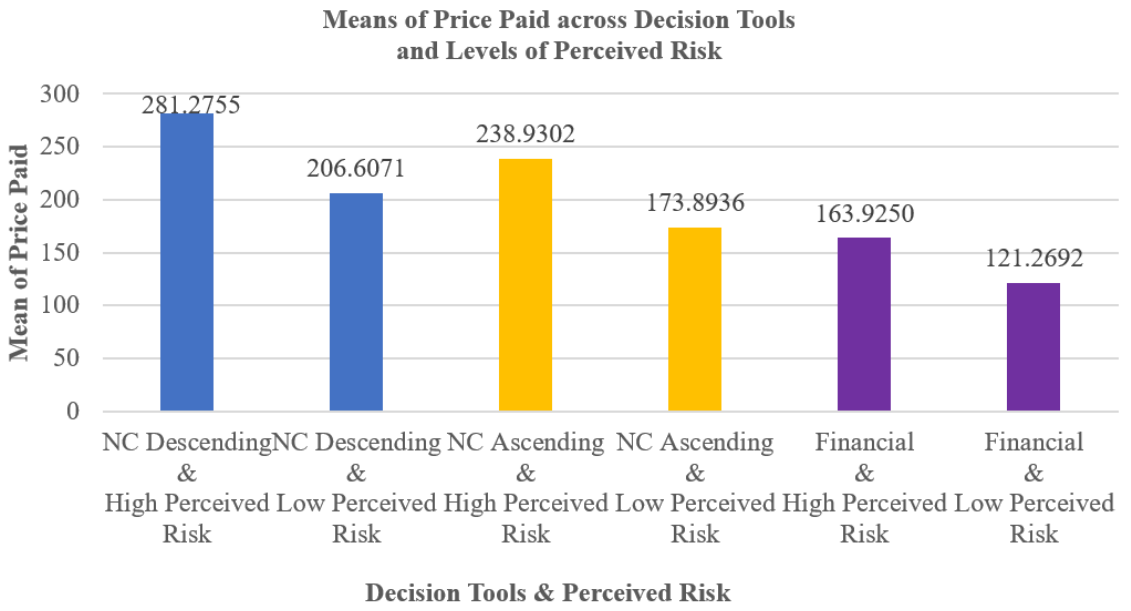



*Figure 26 Means of prices paid across groups differentiating decision tool used and perceived risk condition.*

### 5.3.3.3 DECISION APPROACH MODERATION ANALYSIS

ANCOVA was carried out to test whether decision approach (being driven primarily by price heuristics or not) moderates the effects of NC Descending, NC Ascending, and Financial tools on user's decision quality. Results for the analysis, as shown in Table 63 below, indicate that there is a significant interaction between the decision tools and user's decision approach: F (3, 251) = 61.344, p = .00000. $R^2$ = .423 indicates that the usage of the three decision tools and user's decision approach explain about 42.3 % of the variance in price paid by the user for a health plan.

The interaction plot shown in Figure 28 demonstrates that for users driven strongly by price heuristics, the prices paid for the health plans are lower using the three decision tools than for users driven weakly by price heuristics in their decision approach. These findings are examined in detail and delineated further below in post-hoc analysis.

Full results are demonstrated in tables 63-71 and Figures 27 and 28.

| ANCOVA RESULTS (DV: Price Paid) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Source | Type III Sum of Squares | df | Mean Square | F | Sig. | Partial Eta Squared | Observed Power[b] |
| Corrected Model | 769180.122[a] | 3 | 256393.374 | 61.344 | .00000 | .423 | 1.000 |
| Intercept | 41876.513 | 1 | 41876.513 | 10.019 | .00174 | .038 | .884 |
| Decision Tool* Decision Approach | 769180.122 | 3 | 256393.374 | 61.344 | .00000 | .423 | 1.000 |
| Error | 1049075.707 | 251 | 4179.584 | | | | |
| Total | 12092791.50 | 255 | | | | | |
| Corrected Total | 1818255.829 | 254 | | | | | |
| | | | | | | | |
| [a] $R^2$ = .423 (Adjusted $R^2$ = .416) | | | | | | | |
| [b] Computed using alpha = .05 | | | | | | | |

*Table 63 ANCOVA results for Study 2 with decision approach moderation.*

| Between-Subjects Factors | | | |
|---|---|---|---|
| | | Value Label | N |
| Decision Tool | 4.00 | NC Descending | 89 |
| | 5.00 | NC Ascending | 89 |
| | 6.00 | Financial | 77 |

*Table 64 Between-subjects factors for ANCOVA with decision approach.*

| Descriptives | | | |
|---|---|---|---|
| Price Paid | | | |
| Decision Tool | Mean | Std. Deviation | N |
| NC Descending | 245.5056 | 69.61458 | 89 |
| NC Ascending | 206.3708 | 77.16797 | 89 |
| Financial | 142.4545 | 74.78056 | 77 |
| Total | 200.7294 | 84.60785 | 255 |

*Table 65 Descriptives for ANCOVA with decision approach.*

| Levene's Test of Equality of Error Variances[a] | | | |
|---|---|---|---|
| Dependent Variable: Price Paid | | | |
| F | df1 | df2 | Sig. |
| .274 | 2 | 252 | .760 |
| Tests the null hypothesis that the error variance of the dependent variable is equal across groups.<br>a. Design: Intercept + Decision Tool*Decision Approach | | | |

*Table 66 Levene's Test for ANCOVA with decision approach.*

| White Test for Heteroskedasticity[a,b,c] | | |
|---|---|---|
| Chi-Square | df | Sig. |
| 3.441 | 3 | .328 |
| a. Dependent variable: Price Paid<br>b. Tests the null hypothesis that the variance of the errors does not depend on the values of the independent variables.<br>c. Design: Intercept + Decision Tool*Decision Approach | | |

*Table 67 White test for heteroskedasticity for ANCOVA with decision approach.*

| F Test for Heteroskedasticity[a,b,c] | | | |
|---|---|---|---|
| F | df1 | df2 | Sig. |
| 1.145 | 3 | 251 | .332 |
| a. Dependent variable: Price Paid<br>b. Tests the null hypothesis that the variance of the errors does not depend on the values of the independent variables.<br>c. Design: Intercept + Decision Tool*Decision Approach | | | |

*Table 68 F Test for heteroskedasticity for ANCOVA with decision approach.*

| Estimates | | | | |
|---|---|---|---|---|
| Dependent Variable: Price Paid | | | | |
| | | | 95% Confidence Interval | |
| Decision Tool | Mean | Std. Error | Lower Bound | Upper Bound |
| NC Descending | 243.058[a] | 6.729 | 229.805 | 256.311 |
| NC Ascending | 209.743[a] | 6.761 | 196.427 | 223.060 |
| Financial | 141.955[a] | 7.172 | 127.831 | 156.079 |
| a. Covariates appearing in the model are evaluated at the following values: Perceived Risk = 18.6588 | | | | |

*Table 69 Estimates for ANCOVA with decision approach.*

| Pairwise Comparisons | | | | | | |
|---|---|---|---|---|---|---|
| Dependent Variable: Price Paid | | | | | | |
| | | | | | 95% Confidence Interval[b] | |
| (I) Decision Tool | (J) Decision Tool | Mean Difference (I-J) | Std. Error | Sig.[b] | Lower Bound | Upper Bound |
| NC Descending | NC Ascending | 33.315* | 9.467 | .00051381 | 14.671 | 51.959 |
| | Financial | 101.103* | 9.713 | .00000000 | 81.973 | 120.233 |

| | | | | | | |
|---|---|---|---|---|---|---|
| NC Ascending | NC Descending | -33.315* | 9.467 | .00051381 | -51.959 | -14.671 |
| | Financial | 67.789* | 9.761 | .00000000 | 48.565 | 87.012 |
| Financial | NC Descending | -101.103* | 9.713 | .00000000 | -120.233 | -81.973 |
| | NC Ascending | -67.789* | 9.761 | .00000000 | -87.012 | -48.565 |
| Based on estimated marginal means<br>* The main difference is significant at the .05 level.<br>b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments). | | | | | | |

*Table 70 Pairwise comparisons for ANCOVA with decision approach.*

| Univariate Tests | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Dependent Variable: Price Paid | | | | | | | | |
| | Sum of Squares | df | Mean Square | F | Sig. | Partial Eta Squared | Noncent. Parameter | Observed Power[a] |
| Contrast | 465092.36 | 2 | 232546.18 | 55.639 | .00000000 | .307 | 111.277 | 1.000 |
| Error | 1049075.7 | 251 | 4179.584 | | | | | |
| The F tests the effect of Decision Tool. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.<br>a. Computed using alpha = .05 | | | | | | | | |

*Table 71 Univariate tests for ANCOVA with decision approach.*

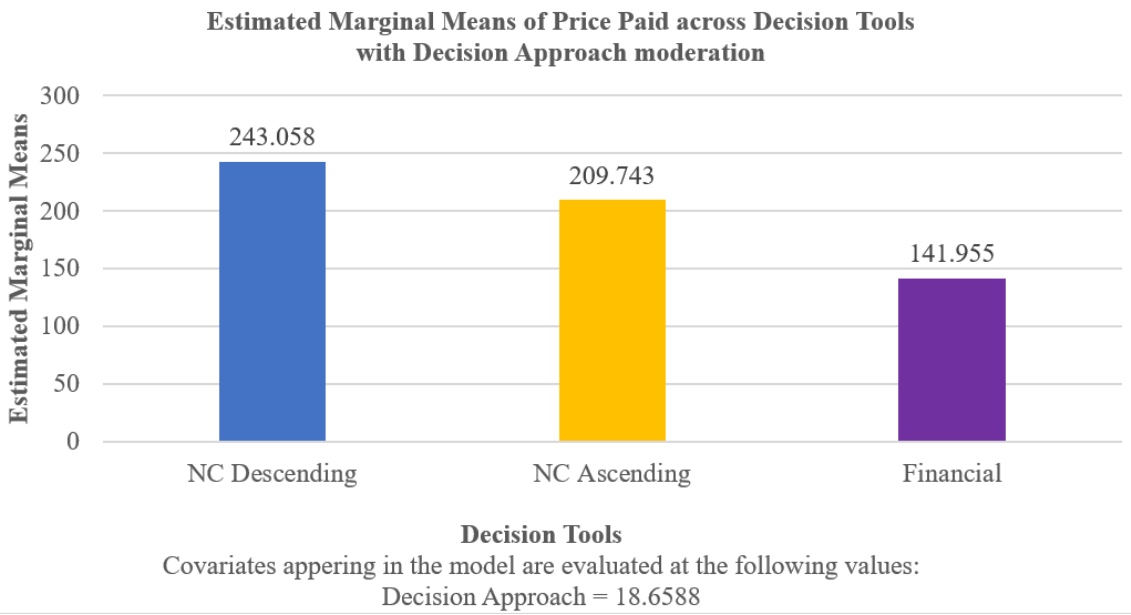



*Figure 27 Estimated marginal means of prices paid for ANCOVA with decision approach.*

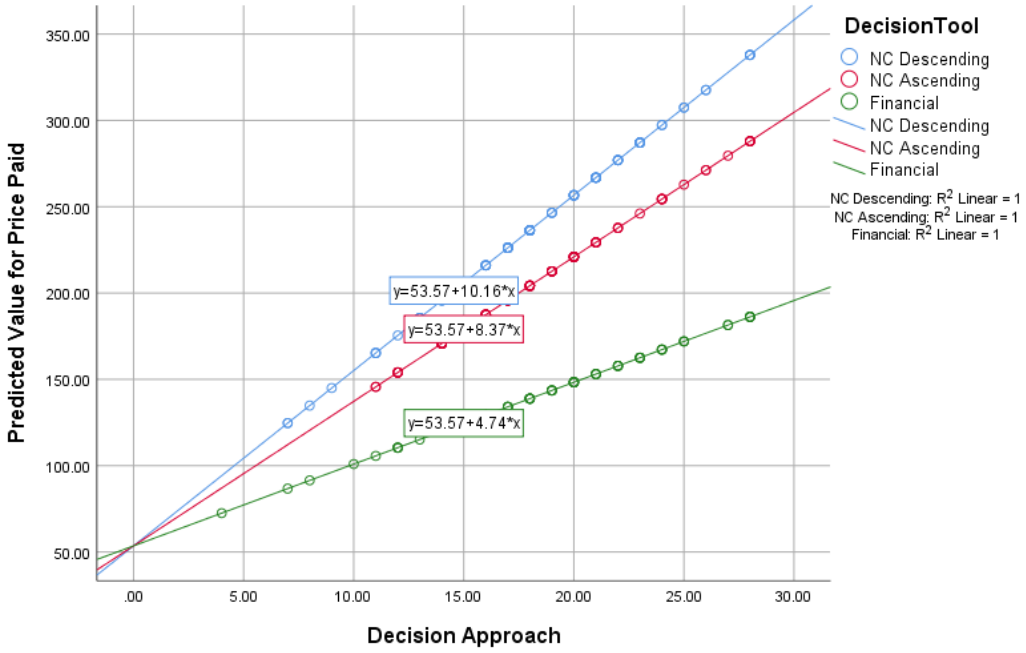



*Figure 28 Interaction plot for decision tools and decision approach.*

## POSTHOC ANALYSIS FOR PRICE HEURISTIC

To compute Strong vs. Weak Price Heuristics-driven Decision Approach, the mean for decision approach was calculated m=18.6602 (Table 72 below), and any respondents scoring 1-18.65 were coded as Strong Price Heuristic and participants scoring 18.651 and above were coded as driven Weakly by Price Heuristics. The data was then split by decision approach.

Post-hoc analysis shows that means of prices paid are higher for users weakly driven by price heuristics (significantly higher for NC Descending p=.00021 and NC Ascending p=.00000). There is no significant difference in price paid using the Financial tool for users driven by strong vs weak price heuristics.

For each group there are significant differences for price paid across the decision tools strongly driven by price heuristics and there is no significant difference across price paid between NC Descending and Ascending for users driven weakly by price heuristics.

## STRONG PRICE HEURISTIC

One-way ANOVA was carried out to test the effects of NC Descending, NC Ascending, and Financial tools on user's decision quality for users strongly driven by price heuristics. Results for the analysis, as shown in Table 75, indicate that there is a significant effect of the three decision tools on decision quality (price paid) of the user: $F(2,137) = 24.594$, $p = .00000$. $\eta^2 = .264$ indicates that the usage of the three decision tools explain around 22.3 % of the variance in price paid for a health plan by the user driven strongly by price heuristics.

For users driven strongly by price heuristics, the price paid for a health plan by the users when making the purchase choice with NC Descending tool is significantly higher from price paid when making the decision with NC Ascending tool: M = 217.6020 vs. M = 169.7941, p = .00072. The price paid with NC Descending tool is also significantly higher from price paid using Financial tool: M = 217.6020 vs. M = 122.9000, p = .00000.

Furthermore, for users driven strongly by price heuristics, the price paid for a health plan by the users, when making the purchase choice with NC Ascending tool, is significantly higher from price paid when making the choice with the Financial tool: M = 169.7941 vs. M = 122.9000, p = .00183.

Full analysis of ANOVA is provided below in tables 73-78 and Figure 29.

| Statistics | | |
|---|---|---|
| Decision Approach | | |
| N | Valid | 256 |
| | Missing | 5 |
| Mean | | 18.6602 |
| Median | | 18.0000 |
| Std. Deviation | | 4.60410 |
| Range | | 24.00 |
| Minimum | | 4.00 |
| Maximum | | 28.00 |

*Table 72 Descriptive statistics for decision approach in Study 2.*

| Descriptives | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Price Paid | | | | | | | | | | |
| | | | | | | 95% Confidence Interval for Mean | | | | |
| | | N | Mean | Std. Deviation | Std. Error | Lower Bound | Upper Bound | Minimum | Maximum | Between Component Variance |
| NC Descending | | 49 | 217.6020 | 62.29123 | 8.89875 | 199.7099 | 235.4942 | 80.00 | 335.00 | |
| NC Ascending | | 51 | 169.7941 | 65.22915 | 9.13391 | 151.4481 | 188.1401 | 59.00 | 305.00 | |
| Financial | | 40 | 122.9000 | 62.75667 | 9.92270 | 102.8294 | 142.9706 | 59.00 | 335.00 | |
| Total | | 140 | 173.1286 | 73.50374 | 6.21220 | 160.8459 | 185.4112 | 59.00 | 335.00 | |
| Model | Fixed Effects | | | 63.50982 | 5.36756 | 162.5146 | 183.7426 | | | |
| | Random Effects | | | | 26.50982 | 57.7288 | 288.5283 | | | 2050.0555 |

*Table 73 Descriptives for Strong Price Heuristic group.*

| Test of Homogeneity of Variances | | | | | |
|---|---|---|---|---|---|
| | | Levene Statistic | df1 | df2 | Sig. |
| Price Paid | Based on Mean | .577 | 2 | 137 | .563 |
| | Based on Median | .212 | 2 | 137 | .809 |
| | Based on Median and with adjusted df | .212 | 2 | 133.659 | .809 |
| | Based on trimmed mean | .523 | 2 | 137 | .594 |

*Table 74 Homogeneity of variances test for Strong Price Heuristic group.*

| ANOVA RESULTS (DV: Price Paid) | | | | | | |
|---|---|---|---|---|---|---|
| Source | Sum of Squares | df | Mean Square | F | Sig. | Eta sq. |
| Between Groups | 198400.008 | 2 | 99200.004 | 24.594 | .00000 | .264 |
| Within Groups | 552589.178 | 137 | 4033.498 | | | |
| Total | 750989.186 | 139 | | | | |

*Table 75 ANOVA for the effects of decision tools for users strongly driven by price heuristics.*

| Robust Tests of Equality of Means | | | | |
|---|---|---|---|---|
| Price Paid | | | | |
| | Statistic[a] | df1 | df2 | Sig. |
| Welch | 25.177 | 2 | 89.228 | .00000000 |
| Brown-Forsythe | 24.676 | 2 | 134.181 | .00000000 |
| a. Asymptotically F distributed | | | | |

*Table 76 Equality of means tests for users driven strongly by price heuristics.*

| Multiple Comparisons | | | | | | | |
|---|---|---|---|---|---|---|---|
| Dependent Variable: Price Paid | | | | | | | |
| | | | | | | 95% Confidence Interval | |
| | (I) Decision Tool | (J) Decision Tool | Mean Difference (I-J) | Std. Error | Sig. | Lower Bound | Upper Bound |
| Tukey HSD | NC Descending | NC Ascending | 47.80792* | 12.70451 | .00072168 | 17.7051 | 77.9108 |
| | | Financial | 94.70204* | 13.53343 | .00000001 | 62.6351 | 126.7690 |
| | NC Ascending | NC Descending | -47.80792* | 12.70451 | .00072168 | -77.9108 | -17.7051 |
| | | Financial | 46.89412* | 13.41364 | .00183258 | 15.1110 | 78.6772 |
| | Financial | NC Descending | -94.70204* | 13.53343 | .00000001 | -126.7690 | -62.6351 |
| | | NC Ascending | -46.89412* | 13.41364 | .00183258 | -78.6772 | -15.1110 |
| Scheffe | NC Descending | NC Ascending | 47.80792* | 12.70451 | .00118522 | 16.3674 | 79.2485 |
| | | Financial | 94.70204* | 13.53343 | .00000000 | 61.2101 | 128.1940 |
| | NC Ascending | NC Descending | -47.80792* | 12.70451 | .00118522 | -79.2485 | -16.3674 |
| | | Financial | 46.89412* | 13.41364 | .00286946 | 13.6987 | 80.0896 |
| | Financial | NC Descending | -94.70204* | 13.53343 | .00000000 | -128.1940 | -61.2101 |
| | | NC Ascending | -46.89412* | 13.41364 | .00286946 | -80.0896 | -13.6987 |
| * The main difference is significant at the .05 level | | | | | | | |

*Table 77 Multiple comparisons for users driven strongly by price heuristics.*

| Price Paid | | | | | |
|---|---|---|---|---|---|
| | | | | | Subset for alpha = .05 |
| | Decision Tool | N | 1 | 2 | 3 |
| Tukey HSD[a,b] | Financial | 40 | 122.9000 | | |
| | NC Ascending | 51 | | 169.7941 | |
| | NC Descending | 49 | | | 217.6020 |
| | Sig. | | 1.000 | 1.000 | 1.000 |
| Scheffe[a,b] | Financial | 40 | 122.9000 | | |
| | NC Ascending | 51 | | 169.7941 | |
| | NC Descending | 49 | | | 217.6020 |
| | Sig. | | 1.000 | 1.000 | 1.000 |

Means for groups in homogenous subsets are displayed.
a. Uses Harmonic Mean Sample Size = 46.142.
b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

*Table 78 Homogeneous subsets for users driven strongly by price heuristics.*

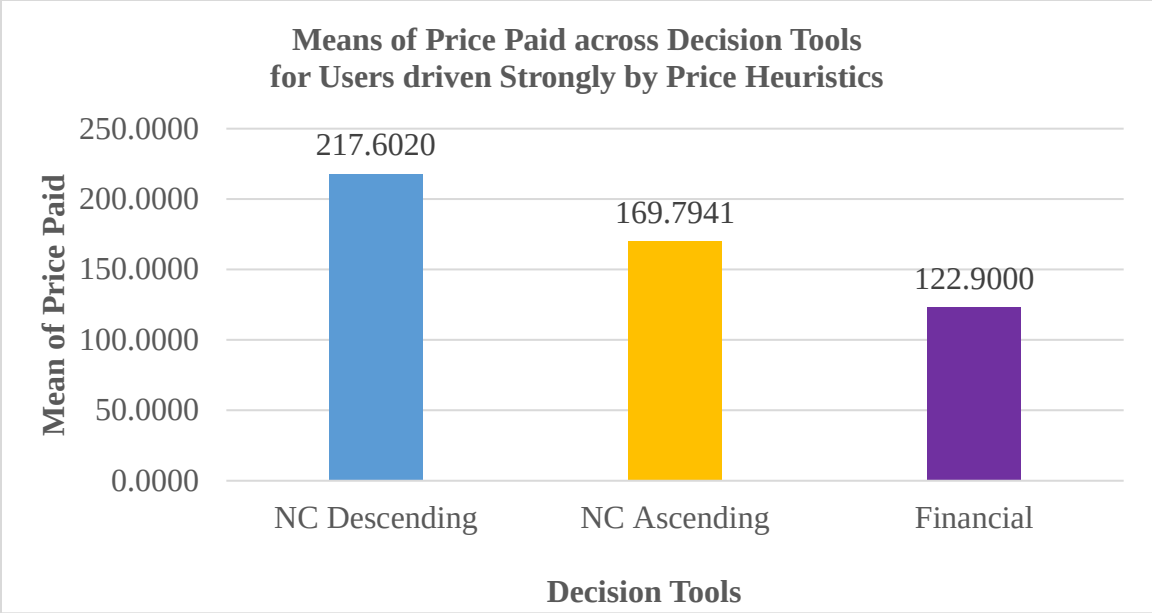



*Figure 29 Means of prices paid across decision tools by users driven strongly by price heuristics.*

WEAK PRICE HEURISTIC

One-way ANOVA was carried out to test the effects of NC Descending, NC Ascending, and Financial tools on user's decision quality for users strongly driven by price heuristics. Results for the analysis, as shown in Table 81, indicate that there is a significant effect of the three decision tools on decision quality (price paid) of the user: F (2,117) = 30.027, p = .00000. $\eta^2$ = .339 indicates that the usage of the three decision tools explain around 33.9 % of the variance in price paid for a health plan by the user driven weakly by price heuristics.

For users driven weakly by price heuristics, the price paid for a health plan by the users when making the purchase choice with NC Ascending tool is significantly higher from price paid when making the choice with the Financial tool: M = 250.9615 vs. M = 163.3462, p = .00000. The price paid with NC Descending tool is also significantly higher from price paid using Financial tool: M = 280.8929 vs. M = 163.3462, p = .00000.

The price paid for a health plan by the users weakly driven by price heuristics when making the purchase choice with NC Descending tool is not significantly higher from price paid when making the decision with NC Ascending tool: M = 280.8929 vs. M = 250.9615, p = .14028.

Full analysis is displayed in tables 79-86 and Figure 30 below.

| Descriptives | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Price Paid | | | | | | | | | | |
| | | | | | | 95% Confidence Interval for Mean | | | | |
| | | N | Mean | Std. Deviation | Std. Error | Lower Bound | Upper Bound | Minimum | Maximum | Between Component Variance |
| NC Descending | | 42 | 280.8929 | 62.14612 | 9.58936 | 261.5268 | 300.2590 | 132.50 | 335.00 | |
| NC Ascending | | 39 | 250.9615 | 69.10760 | 11.06607 | 228.5594 | 273.3636 | 132.50 | 335.00 | |
| Financial | | 39 | 163.3462 | 79.63677 | 12.75209 | 137.5309 | 189.1614 | 59.00 | 335.00 | |
| Total | | 120 | 232.9625 | 85.94312 | 7.84550 | 217.4276 | 248.4974 | 59.00 | 335.00 | |
| Model | Fixed Effects | | | 70.45803 | 6.43191 | 220.2244 | 245.7006 | | | |
| | Random Effects | | | | 35.27710 | 81.1774 | 384.7476 | | | 3604.8077 |

*Table 79 Descriptives for users driven weakly by price heuristics.*

| Test of Homogeneity of Variances | | | | | |
|---|---|---|---|---|---|
| | | Levene Statistic | df1 | df2 | Sig. |
| Price Paid | Based on Mean | 1.161 | 2 | 117 | .317 |
| | Based on Median | .492 | 2 | 117 | .613 |
| | Based on Median and with adjusted df | .492 | 2 | 94.122 | .613 |
| | Based on trimmed mean | 1.096 | 2 | 117 | .338 |

*Table 80 Homogeneity of variances test for users driven weakly by price heuristics.*

| ANOVA RESULTS (DV: Price Paid) | | | | | | |
|---|---|---|---|---|---|---|
| Source | Sum of Squares | df | Mean Square | F | Sig. | Eta sq. |
| Between Groups | 298133.044 | 2 | 149066.522 | 30.027 | .00000 | .339 |
| Within Groups | 580827.037 | 117 | 4964.334 | | | |
| Total | 878960.081 | 119 | | | | |

*Table 81 ANOVA for the effects of decision tools for users weakly driven by price heuristic.*

| Robust Tests of Equality of Means | | | | |
|---|---|---|---|---|
| Price Paid | | | | |
| | Statistic[a] | df1 | df2 | Sig. |
| Welch | 27.333 | 2 | 76.338 | .00000000 |
| Brown-Forsythe | 29.769 | 2 | 110.286 | .00000000 |
| a. Asymptotically F distributet | | | | |

*Table 82 Equality of means tests for users driven weakly by price heuristics.*

| Multiple Comparisons | | | | | | | |
|---|---|---|---|---|---|---|---|
| Dependent Variable: Price Paid | | | | | | | |
| | | | | | | 95% Confidence Interval | |
| | (I) Decision Tool | (J) Decision Tool | Mean Difference (I-J) | Std. Error | Sig. | Lower Bound | Upper Bound |
| Tukey HSD | NC Descending | NC Ascending | 29.93132 | 15.66809 | .14028044 | -7.2633 | 67.1260 |
| | | Financial | 117.5467* | 15.66809 | .00000001 | 80.3520 | 154.7414 |
| | NC Ascending | NC Descending | -29.93132 | 15.66809 | .14028044 | -67.1260 | 7.2633 |
| | | Financial | 87.61538* | 15.95560 | .00000071 | 49.7382 | 125.4926 |
| | Financial | NC Descending | -117.547* | 15.66809 | .00000001 | -154.7414 | -80.3520 |
| | | NC Ascending | -87.61538* | 15.95560 | .00000071 | -125.4926 | -49.7382 |
| Scheffe | NC Descending | NC Ascending | 29.93132 | 15.66809 | .16582650 | -8.9165 | 68.7791 |
| | | Financial | 117.5467* | 15.66809 | .00000000 | 78.6989 | 156.3945 |
| | NC Ascending | NC Descending | -29.93132 | 15.66809 | .16582650 | -68.7791 | 8.9165 |
| | | Financial | 87.61538* | 15.95560 | .00000149 | 48.0547 | 127.1760 |
| | Financial | NC Descending | -117.547* | 15.66809 | .00000000 | -156.3945 | -78.6989 |
| | | NC Ascending | -87.61538* | 15.95560 | .00000149 | -127.1760 | -48.0547 |
| * The main difference is significant at the .05 level | | | | | | | |

*Table 83 Multiple comparisons for users driven weakly by price heuristics.*

| Price Paid | | | | |
|---|---|---|---|---|
| | | | Subset for alpha = .05 | |
| | Decision Tool | N | 1 | 2 |
| Tukey HSD[a,b] | Financial | 39 | 163.3462 | |
| | NC Ascending | 39 | | 250.9615 |
| | NC Descending | 42 | | 280.8929 |
| | Sig. | | 1.000 | .144 |
| Scheffe[a,b] | Financial | 39 | 163.3462 | |
| | NC Ascending | 39 | | 250.9615 |
| | NC Descending | 42 | | 280.8929 |
| | Sig. | | 1.000 | .169 |
| Means for groups in homogenous subsets are displayed.<br>a. Uses Harmonic Mean Sample Size = 39.951.<br>b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed. | | | | |

*Table 84 Homogeneous subsets for users driven weakly by price heuristics.*

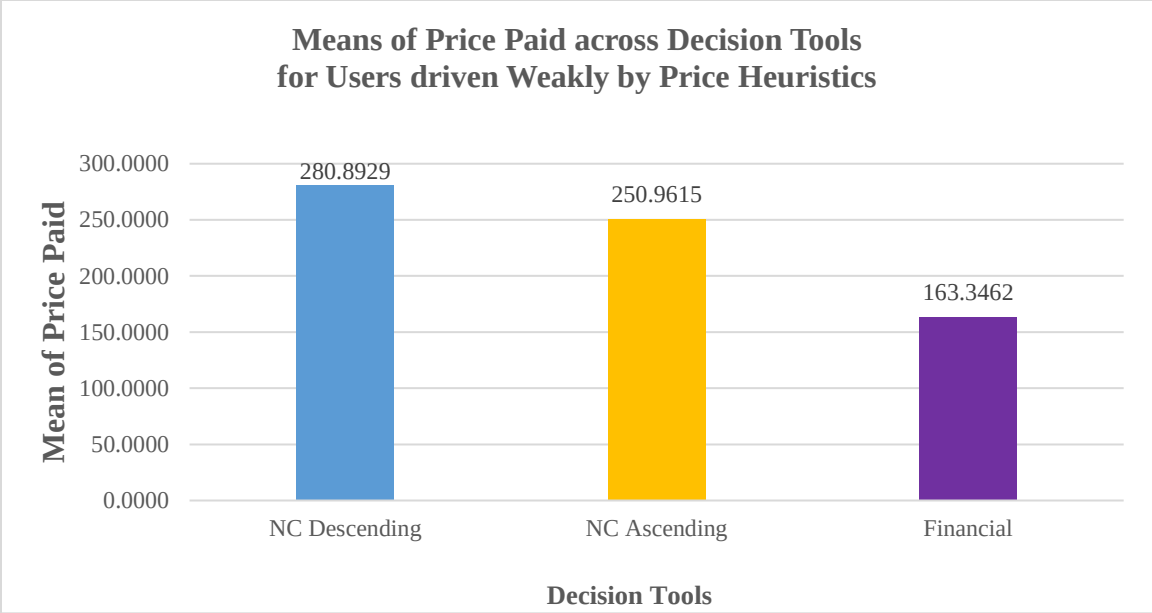



*Figure 30 Means of prices paid across decision tools for users driven weakly by price heuristics.*

ADDITIONAL ANALYSIS FOR DECISION APPROACH

An additional analysis was done to examine the differences across prices paid using the three decision tools and decision approach. The data were recoded to account for both decision tool and decision approach and ANOVA was carried out to check price mean differences across the groups.

Results for the analysis, as shown in Table 87 below, indicate that there is a significant interaction between the decision tools and user's perceived risk: $F(5, 249) = 32.265$, $p = .00005$.

Price paid using NC Descending tool was significantly lower for users driven strongly by price heuristics than users driven weakly by price heuristics (NC Descending Strong PH vs Weak PH p=.00021).

Price paid using NC Ascending tool was significantly lower for users driven strongly by price heuristics than users driven weakly by price heuristics (Strong PH vs Weak PH p=.00000).

There was no significant difference found for price paid using the Financial tool for users driven by strong vs weak price heuristics.

Interestingly, there was no significant difference in price paid for users driven strongly by price heuristics and making the decision using NC Descending tool vs users driven weakly by price heuristics and making the decision using NC Ascending tool.

Full results are shown in tables 85-90 below and Figure 31.

| Descriptives | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Price Paid | | | | | | | | | | |
| | | | | | 95% Confidence Interval for Mean | | | | | |
| | | N | Mean | Std. Deviation | Std. Error | Lower Bound | Upper Bound | Minimum | Maximum | Between Component Variance |
| NC Descending & Strong PH | | 47 | 213.8830 | 60.52714 | 8.82879 | 196.1115 | 231.6544 | 80.00 | 335.00 | |
| NC Descending & Weak PH | | 42 | 280.8929 | 62.14612 | 9.58936 | 261.5288 | 300.2590 | 132.50 | 335.00 | |
| NC Ascending & Strong PH | | 50 | 171.5900 | 64.60521 | 9.13656 | 153.2294 | 189.9506 | 59.00 | 305.00 | |
| NC Ascending & Weak PH | | 39 | 250.9615 | 69.10760 | 11.06607 | 228.5594 | 273.3636 | 132.50 | 335.00 | |
| Financial & Strong PH | | 38 | 121.0132 | 63.56817 | 10.31212 | 100.1188 | 141.9075 | 59.00 | 335.00 | |
| Financial & Weak PH | | 39 | 163.3462 | 79.63677 | 12.75209 | 137.5309 | 189.1614 | 59.00 | 335.00 | |
| Total | | 255 | 200.7294 | 84.60785 | 5.29835 | 190.2951 | 211.1637 | 59.00 | 335.00 | |
| Model | Fixed Effects | | | 66.56763 | 4.16863 | 192.5191 | 208.9397 | | | |
| | Random Effects | | | | 23.83300 | 139.4647 | 261.9941 | | | 3267.1768 |

*Table 85 Descriptives for data grouped by decision tool * decision approach.*

| Test of Homogeneity of Variances | | | | | |
|---|---|---|---|---|---|
| | | Levene Statistic | df1 | df2 | Sig. |
| Price Paid | Based on Mean | 1.974 | 5 | 249 | .083 |
| | Based on Median | 1.121 | 5 | 249 | .350 |
| | Based on Median and with adjusted df | 1.121 | 5 | 218.407 | .350 |
| | Based on trimmed mean | 1.837 | 5 | 249 | .106 |

*Table 86 Homogeneity of variances test - data grouped by decision tool * decision approach.*

| ANOVA RESULTS (DV: Price Paid) | | | | | |
|---|---|---|---|---|---|
| Source | Sum of Squares | df | Mean Square | F | Sig. |
| Between Groups | 714874.598 | 5 | 142974.920 | 32.265 | .00000 |
| Within Groups | 1103381.232 | 249 | 4431.250 | | |
| Total | 1818255.829 | 254 | | | |

*Table 87 ANOVA result for data grouped by decision tool * decision approach.*

| Robust Tests of Equality of Means | | | | |
|---|---|---|---|---|
| Price Paid | | | | |
| | Statistic[a] | df1 | df2 | Sig. |
| Welch | 33.413 | 5 | 113.797 | .00000000 |
| Brown-Forsythe | 31.877 | 5 | 229.914 | .00000000 |
| a. Asymptotically F distributed | | | | |

*Table 88 Equality of means tests - data grouped by decision tool * decision approach.*

| Multiple Comparisons | | | | | | | |
|---|---|---|---|---|---|---|---|
| Dependent Variable: Price Paid | | | | | | | |
| | | | | | | 95% Confidence Interval | |
| | (I) Decision Tool | (J) Decision Tool | Mean Difference (I-J) | Std. Error | Sig. | Lower Bound | Upper Bound |
| Scheffe | NC Descending & Strong PH | NC Descending & Weak PH | -67.00988* | 14.13463 | .0006110698 | -114.4218 | -19.5979 |
| | | NC Ascending & Strong PH | 42.29298 | 13.52431 | .0857953401 | -3.0718 | 87.6577 |
| | | NC Ascending & Weak PH | -37.07856 | 14.41887 | .2550002929 | -85.4439 | 11.2868 |
| | | Financial & Strong PH | 92.86982* | 14.52218 | .0000003619 | 44.1579 | 141.5817 |
| | | Financial & Weak PH | 50.53682* | 14.41887 | .0339379245 | 2.1715 | 98.9022 |
| | NC Descending & Weak PH | NC Descending & Strong PH | 67.00988* | 14.13463 | .0006110698 | 19.5979 | 114.4218 |
| | | NC Ascending & Strong PH | 109.30286* | 13.93309 | .0000000001 | 62.5669 | 156.0388 |
| | | NC Ascending & Weak PH | 29.93132 | 14.80296 | .5380210472 | -19.7224 | 79.5851 |
| | | Financial & Strong PH | 159.87970* | 14.90362 | .0000000000 | 109.8883 | 209.8711 |
| | | Financial & Weak PH | 117.54670* | 14.80296 | .0000000001 | 67.8930 | 167.2004 |
| | NC Ascending | NC Descending & Strong PH | -42.29298 | 13.52431 | .0857953401 | -87.6577 | 3.0718 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | & Strong PH | NC Descending & Weak PH | -109.30286* | 13.93309 | .0000000001 | -156.0388 | -62.5669 |
| | | NC Ascending & Weak PH | -79.37154* | 14.22135 | .0000182948 | -127.0744 | -31.6687 |
| | | Financial & Strong PH | 50.57684* | 14.32609 | .0317105475 | 2.5227 | 98.6310 |
| | | Financial & Weak PH | 8.24385 | 14.22135 | .9968706615 | -39.4590 | 55.9467 |
| | NC Ascending & Weak PH | NC Descending & Strong PH | 37.07856 | 14.41887 | .2550002929 | -11.2868 | 85.4439 |
| | | NC Descending & Weak PH | -29.93132 | 14.80296 | .5380210472 | -79.5851 | 19.7224 |
| | | NC Ascending & Strong PH | 79.37154* | 14.22135 | .0000182948 | 31.6687 | 127.0744 |
| | | Financial & Strong PH | 129.94838* | 15.17345 | .0000000000 | 79.0519 | 180.8449 |
| | | Financial & Weak PH | 87.61538* | 15.07460 | .0000063159 | 37.0505 | 138.1803 |
| | Financial & Strong PH | NC Descending & Strong PH | -92.86982* | 14.52218 | .0000003619 | -141.5817 | -44.1579 |
| | | NC Descending & Weak PH | -159.87970* | 14.90362 | .0000000000 | -209.8711 | -109.8883 |
| | | NC Ascending & Strong PH | -50.57684* | 14.32609 | .0317105475 | -98.6310 | -2.5227 |
| | | NC Ascending & Weak PH | -129.94838* | 15.17345 | .0000000000 | -180.8449 | -79.0519 |
| | | Financial & Weak PH | -42.33300 | 15.17345 | .1729276329 | -93.2295 | 8.5635 |
| | | NC Descending & Strong PH | -50.53682* | 14.41887 | .0339379245 | -98.9022 | -2.1715 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Financial & Weak PH | NC Descending & Weak PH | -117.54670* | 14.80296 | .0000000001 | -167.2004 | -67.8930 |
| | | NC Ascending & Strong PH | -8.24385 | 14.22135 | .9968706615 | -55.9467 | 39.4590 |
| | | NC Ascending & Weak PH | -87.61538* | 15.07460 | .0000063159 | -138.1803 | -37.0505 |
| | | Financial & Strong PH | 42.33300 | 15.17345 | .1729276329 | -8.5635 | 93.2295 |
| * The main difference is significant at the .05 level | | | | | | | |

*Table 89 Multiple comparisons - data grouped by decision tool * decision approach.*

| Price Paid | | | | | | |
|---|---|---|---|---|---|---|
| | | | Subset for alpha = .05 | | | |
| | Decision Tool | N | 1 | 2 | 3 | 4 |
| Tukey HSD[a,b] | Financial & Strong PH | 38 | 121.0132 | | | |
| | Financial & Weak PH | 39 | | 163.3462 | | |
| | NC Ascending & Strong PH | 50 | | 171.5900 | | |
| | NC Descending & Strong PH | 47 | | | 213.8830 | |
| | NC Ascending & Weak PH | 39 | | | 250.9615 | 250.9615 |
| | NC Descending & Weak PH | 42 | | | | 280.8929 |
| | Sig. | | 1.000 | .993 | .113 | .311 |

Means for groups in homogenous subsets are displayed.
a. Uses Harmonic Mean Sample Size = 42.051.
b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

*Table 90 Homogeneous subsets - data grouped by decision tool * decision approach.*

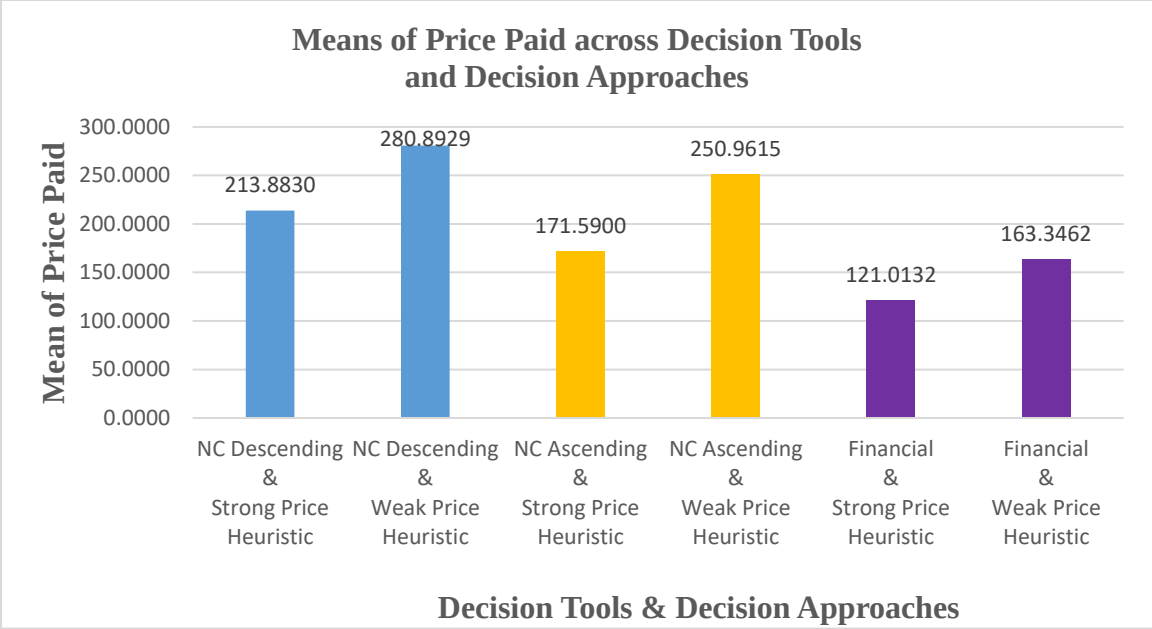



*Figure 31 Means of prices paid across conditions grouped by decision tool * decision approach.*

Results of hypothesis testing for Study 2 are summarized in Table 91 below.

| HYPOTHESIS | RESULT | p-value |
|---|---|---|
| *H4. The effect of usage of an NC Descending tool on users' decision quality will be negative and the effects of usage of NC Ascending and Financial tools on user's decision quality will be positive, such that:* | | |
| *H4A. The price paid for health plan will be higher using NC Descending tool than when using NC Ascending tool;* | SUPPORTED | p =.000 |
| *and H4B. The price paid for health plan will be higher using NC Descending tool than when using Financial tool.* | SUPPORTED | p =.000 |
| *H5. Perceived risk moderates the effect of NC Descending, NC Ascending, and Financial tools on users' decision quality such that the effect of usage of an NC Descending tool on users' decision quality will be negative and the effects of usage of NC Ascending and Financial tools on* | | |

| | | | |
|---|---|---|---|
| *user's decision quality will be positive under high perceived risk but not under low perceived risk.*<br><br>*Under high perceived risk:* | | | |
| | *H5A. The price paid for health plan will be higher using NC Descending tool than when using NC Ascending tool, but there will be no differences for users under low perceived risk;* | SUPPORTED | p=.01398 |
| | *and H5B. The price paid for health plan will be higher using NC Descending tool than when using Financial tool, but there will be no differences for users under low perceived risk.* | NOT SUPPORTED | |
| *H6. Decision approach moderates the effect of NC Descending, NC Ascending, and Financial tools on users' decision quality such that the effect of usage of an NC Descending tool on users' decision quality will be negative and the effects of usage of NC Ascending and Financial tools on user's decision quality will be positive for users driven weakly by price heuristics but not for users driven strongly by price heuristics.*<br><br>*For users driven weakly by price heuristics:* | | | |
| | *H6A. The price paid for health plan will be higher using NC Descending tool than when using NC Ascending tool, but there will be no differences for users driven strongly by price heuristics;* | NOT SUPPORTED | |
| | *and H6B. The price paid for health plan will be higher using NC Descending tool than when using Financial tool, but there will be no differences for users driven strongly by price heuristics.* | NOT SUPPORTED | |

*Table 91 Hypotheses testing for Study 2.*

# 6 DISCUSSION

## 6.1 Study 1: Discussion

As demonstrated by the results of Study 1 and confirming findings from prior literature, choice sets with asymmetrically dominated alternatives can change user's purchase decision: there was a clear switch between the options in NC Descending Anchor HP and Anchor LP tools. Increasing the utility of the available alternative with an incremental increase in the cost associated with it, drives the user to purchase a less expensive option than when the choice set offers an alternative with the same utility change but a minor change in cost. NC Descending with Low Price Anchor yielded the lowest decision quality with plan purchased containing the largest extent in coverage and highest price.

As far as the differences in plans purchased across NC Descending with High Price Anchor and Low Price Anchor versus with No Anchor the results may seem natural at first hand. As much as if an alternative is not offered, it will not be chosen by the user, however, the dynamic of differences across these decision tools demonstrates that choices, and thus, decision quality, are frequently not a manifestation of one's preferences, but can be easily impacted by the characteristics of the output.

The circumstances of the user altered the dynamics of the effects of the tools only for users under low perceived risk. As hypothesized, those users had a smaller inclination to purchase the top plans whose coverage differed in terms of additional skin cancer benefits. Interestingly, the effect of NC Descending with Anchor HP tool remained robust for those users also – only the effect of LP Anchor tool changed the decision quality of the users under low perceived risk.

Furthermore, as hypothesized, the effects of the tools differed when the users were less likely to be engaged in cost-utility trade-off and were primarily interested in minimizing the cost of the plan. Similarly to the moderating effect of perceived risk, the effect of the tool with a High Price Anchor remained robust, while the effect of Low Price Anchor dissipated for users whose decision approach was strongly driven by price heuristics.

## 6.2 Study 2: Discussion

The results of Study 2 indicate that there is a significant difference in price paid for health plans across the NC Descending, NC Ascending, and Financial tools. As expected, the highest price is paid using NC Descending tool, it is lower when making the choice using NC Ascending tool, and further lower using Financial tool. This latter result of the price paid being significantly lower using Financial tool was not anticipated (it was only anticipated that there would be a difference in NC Descending>NC Ascending and NC Descending>Financial). This result shows that customization and breaking down the health plans constituted added value and further mitigated overspending effect.

Although perceived risk didn't fully moderate the effects of the decision tools on user's decision quality, although as the additional analysis demonstrated, the prices paid by users under high perceived risk were significantly higher than prices paid by users under low perceived risk using NC Descending and NC Ascending tools. This finding is interesting in the sense that users under high perceived risk will pay higher prices using NC tools, but not significantly higher than users under low perceived risk when making the decision using the Financial tool. Additionally, being under high perceived risk does not guarantee paying higher prices regardless of the tool, as reference dependence the users were subject to still held.

Using the Financial tool significantly lowered the price paid for users under low perceived risk, further supporting the notion that customization can potentially mitigate overspending.

Decision approach also didn't fully moderate the effects of the decision tools on user's decision quality, but the prices paid were significantly lower for users driven strongly by price heuristics when making the decision using NC Descending and NC Ascending tool than for users driven weakly by price heuristics and making the decision with those tools. This result indicates that users focused solely on price will pay lower prices than other users when making the choice with non-compensatory tools. There was no significant difference in price paid using the Financial tool for users driven strongly or weakly by price heuristics.

Users driven strongly by price heuristics paid significantly different prices using the three tools, thus were still subject to reference dependence; while users driven weakly by price heuristics paid similar prices using non-compensatory tools but further lower prices using the Financial tool. This result indicates that the Financial tool reduced price paid even when NC Ascending tool didn't.

Furthermore, as per the suggestions proposed by Novemsky & Kahneman (2005), being under low perceived risk has been argued here to constitute an environment in which users should seek generic health coverage (rather than specialized kind) at lower prices. The findings here support this argument, thus add to the extant empirical evidence on decision makers' intention reducing loss aversion. However, the moderating effect of decision approach has not been supported here and reference dependence remained robust for users driven both weakly as well as strongly by price heuristics.

## 6.3 Study 1 & 2: Collective Discussion

### 6.3.1 The role of output format in decision quality

Considering that the choice sets may include different levels of price and utility changes – whether they are gradual or more extreme – the nature of the format of the output can affect user's decision-making and their ultimate choice. Users tend to be subject to reference dependence based on the option they begin their consideration of options with and such reference dependence will thus have an effect on their purchase decision: for instance when the alternatives are displayed by the highest price on top of the list and decreasing the price as the user evaluates the options further down the list, the user gains in cost while losing in utility, subject to loss aversion, the user eventually pays a higher price than when the options are displayed starting from the least expensive item.

### 6.3.2 The role of output characteristics in decision quality

The findings indicate that the purchase choice of the user is not only a result of their preferences, their own characteristics, or even their circumstances (which can affect their needs perceptions), but also are affected by the characteristics of the alternatives provided by the tool. These characteristics may occur randomly (not predetermined by the vendor) or purposely (if offered by the same vendor). As shown in Study 1, a large – or alternatively very small - price difference across two options can change user's choice of an item. In any case, the decision the user makes is not entirely a representation of their preferences but also is affected by the consideration of the other alternatives in the choice set, and, particularly, the different aspects they may have.

### 6.3.3 The role of decision tool design in the impact of online decision tool usage

As shown by the results of Study 2, when making the choice with a customization-based tool with a choice set akin to a choice set as displayed in a Price Low-High output format, the price paid by the user is further lower than when making the choice with NC Ascending tool. This finding (price paid with Financial tool is significantly lower than NC Ascending tool) was not initially expected (only a difference between NC Descending and Financial tools was anticipated); however, it indicates that a combination of output format, content, and tool design, can further minimize spending effect evoked by reference dependence. The Financial tool exhibits a combination of all those elements: 1) it is based on customization, thus enabling the user to pick the attribute packages they are interested in instead of browsing through a list of items, 2) it displays the attribute packages in two columns[13] starting from a package akin to the NC Ascending tool – starting from the lowest price package[14], and 3) it breaks down the costs and coverage benefits of the different plans characterizing them. Arguably, the customization feature and the breakdown of costs and utilities, further enforces cost-utility analysis, and, since the reference point in this tool constitutes the lowest price (and the lowest attribute package), every new attribute package added is associated with a loss of cost and gain in utility. It is also believed here that the customization-based tool reduces heuristic processing which the users are involved in when making the choice when options are displayed as a sorted list. Interestingly, (Biswas, 2009) showed that options framing holds under rational but not under experiential processing modes and (Peng, Xia, Fanglin, et al., 2016) demonstrated that options framing held when

[13] It is assumed here the users evaluate the attribute packages in an F-fashion.

[14] Starting from the lowest price package and increasing the utility as in NC Ascending tool with price increasing accordingly.

participants were focusing on cost-utility analysis but not when they were focusing on their enjoyment out of the purchase; in this experiment the customization-based tool further lowered price paid thus extending prior findings.

These findings indicate that tool design can further affect decision outcome in combination with the way information is delivered to the user.

Furthermore, in addition to the discussion pertaining to output format, if the design of the decision tool yields a certain method of displaying the options, then the dynamics of the output format will also hold. However, this may not always be the case – a non-compensatory tool may also display its output in several columns (or in other ways, such as side by side), not necessarily as single sorted list.

The results of this study support and extends the findings of (Song et al., 2007) showing inferiority of non-compensatory tools and further extends (Tan et al., 2010) indicating user's higher decision quality when number of attributes is low, by looking at the phenomenon in detail, taking into consideration the interaction between the user, the tool and information delivery characteristics.

### 6.3.4 The role of decision context in the impact of online decision tool usage

The situational factors that the user finds themselves in, such as the level of perceived risk can affect their perception of anticipated need for health services, thus driving them to purchase more coverage and/or pay a higher price (such as pay a higher premium in exchange for lower deductible). If intention moderates loss aversion (Novemsky &

Kahneman, 2005), users under high perceived risk should be inclined to purchasing different alternatives than users under low perceived risk, thus altering the effect of the characteristics and the format of the output – if the effect of the output is a result of reference dependence. As shown by the findings here, there is a tendency to moderate the effect of the decision tools, although not fully – since, for instance, NC Descending with HP Anchor tool remained robust for users both under high as well as low perceived risk.

### 6.3.5 The role of user's decision approach in the impact of online decision tool usage

Similarly to decision context, if decision approach of the user is associated with their primary interest/ objective, it is also likely to change the decision outcome regardless of how information is delivered by the tool. As presented in the findings of this study, if information delivery subjects the user to reference dependence – and the consideration of the available alternatives is associated with cost-utility trade-off – such effect is diminished when the user is focused on one particular element during their decision, for instance cost minimization. For users who rely on price of the available options and don't pay attention to the coverage benefits of the health plan, the choice will be different (lower price paid) than for those who take both aspects (price and benefits) into consideration. However, as shown by findings of Study 1, these effects are not entirely eradicated, as the effect of NC Descending Anchor HP tool still had an influence on their decision.

### 6.3.5 Research Questions Answered

1. How can the design of an online decision tool affect user's purchase decision?

The design of an online decision tool can have varying effects on user's decision quality – potentially decreasing or improving it, depending on the specific features and how it is

used. As the decision tool design constitutes only one aspect of an online decision - making process, the effect of usage of an online decision aid should be considered in the light of both how the alternatives are generated by the tool as well as how they are presented to the user.

The decision quality obtained by the user may be lower, that is the user may spend more on a health plan, using different types of decision tools – this however depends on how the available health insurance plans are displayed to the user and how they are characterized. If the price of the alternatives is the focus of the decision tools and the choice sets, these overspending effects may be evoked by decoy effect or price order effect.

2. How can such an effect be mitigated?

Indeed, a particular decision tool design in combination with information delivery, can reduce price paid for a health plan if the overspending effect is evoked by reference dependence.

3. Which consumers are particularly vulnerable to this effect?

Particularly vulnerable to overspend are users not driven by price heuristics or users in circumstances driving the need to purchase more (or pay a higher price), such as users under high perceived risk.

4. What is the effect of non-compensatory online decision tool usage on buyer's decision quality?

The use of a non-compensatory online decision tool on buyer's decision quality is lower (higher price paid) when the alternatives are presented as a sorted list by price in a

descending fashion, it is higher (lower price paid) when the options are displayed as a sorted list by price in an ascending fashion.

User's decision quality may also be lower when the choice set contains an asymmetrically dominated alternative focusing user's attention to a particular option. Although this is not only pertinent to a non-compensatory tool, it needs to be mentioned here, if the focus is on single attribute-based decision tools.

5. What is the effect of a customization-based online decision tool usage on buyer's decision quality?

The effect of a customization-based online decision tool increases user's decision quality as the price paid by those users is lower than when making the choice with non-compensatory tools.

6. How will these effects vary for consumers under different levels of perceived risk and who differ in the decision approach they undertake?

For users under high perceived risk, the effects of non-compensatory tools may exacerbate overspending effect, as risk perception places the user in a position of greater anticipated need of health services, thus driving them to purchase more. For users who are primarily driven by price heuristics spending will be lower than for users weakly driven by price heuristics, as those users are less engaged in cost-utility analysis across the available options and are focused on cost minimization regardless of information delivery.

### 6.3.6 Generalizability

Although the studies carried out here adopt price anchoring and price order effect (with assumptions relating to price and utility drops or increases), which may not always occur in outputs generated by non-compensatory tools, the dynamics of the effect of a non-compensatory tool enabling price sorting is largely generalizable. Reference dependence and loss aversion, both effects which price anchoring and price order effect stem from, have been demonstrated to be robust across conditions and contexts (Ariely, Huber, & Wertenbroch, 2005; Jin et al., 2012; Levin, Schreiber, Lauriola, & Gath, 2002; Suk et al., 2012). Varying levels of anchors in pricing and presence of decoys differentially affect consumer choices (Ariely et al., 2005; Heath & Chatterjee, 1995) thus different price anchors as well as the non-existence of an anchor is examined in this study.

It is therefore reasoned that the findings related to the effects of non-compensatory and customization-based tool designs as well as output characteristics and format should apply not only to the specifics outlined in the choice sets adopted here. Indeed, by focusing the study on simple individual features of online decision tools, the findings can apply to different contexts and other tools adopting these design and information delivery features – as long as the user is subject to reference dependence. For instance, (Cai & Xu, 2008) who studied item sorting in e-commerce for products with positive correlation between price and quality whereby the items were sorted by descending and ascending quality as well as random ordering of quality; they showed that users include items of higher quality in their consideration sets when provided with a descending list.

Furthermore, although the decision adopted in this study – purchase of a health insurance plan under high perceived risk - is specific, it generalizes to other settings and

circumstances in which the user makes a purchase choice. At minimum, it generalizes to products and services of precautionary nature, although since relative pricing has been studied in a number of contexts and has been shown to be robust, it can be argued that the focus on health insurance here does not limit the findings to this item. Furthermore, decision under perceived risk, taking into account its idiosyncrasies, can also arguably constitute an exemplary context where the user might be willing to pay a higher price or purchase an item of greater utility than otherwise.

# 7 CONCLUSIONS

## 7.1 Contribution

This study contributes to IS literature by considering the effectiveness of online decision tools in the setting of the contextual mechanisms of the decision scenario and exploring the dynamics of the fit between decision tool design, output characteristics, the user's situational environment, and the user's cognition. It serves as an illustration of a decision process supported by two types of online decision tools within the more comprehensive context of decision scenario; DSS literature mostly discusses the effectiveness of tools in terms of their capacity to handle cognitive overload, little is known about the mechanisms of decision tools and their effectiveness in the light of a decision process, such as a purchase choice process. It also demonstrates how characteristics of information delivery can subject the user to reference dependence and evoke biased processing.

This study answers a call for research raised by (Xiao & Benbasat, 2007, 2014) to examine decision tool- and user- related factors that impact the effect of usage of online recommendation agents on decision outcomes. Specifically, it investigates the role of design features of a non-compensatory and customization-based tools and their output characteristics in user's choice, and the effect of these features on user's decision quality. It shows that for users making their decision with a non-compensatory tool when the search results are sorted by price, their decision quality – the price they pay – can differ depending on whether the items are sorted in a descending or ascending fashion, and, the situational context of the user. Furthermore, the decision quality will differ for various tool designs and information delivery methods – whether the design of the tool facilitates cost-utility

analysis, or when the display of the alternatives facilitates heuristic processing (such as in a sorted list).

It also extends the research by (Xiao & Benbasat, 2007, 2014) whose propositions regarding output content only referred to utility scores or predicted ratings; as well as whose propositions regarding output format discussed the number of generated alternatives and potential improvement in decision quality of sorted options by evoking heuristic processing.

Drawing from relative pricing literature, this study also extends decision support research to detailed dynamics which can be evoked by the characteristics of the output and the format of the output of online decision tools.

This study also extends prior decision support systems research which has so far largely focused on product-related purchases (Xiao & Benbasat, 2007, 2014) to service purchase tasks. It shows the dynamics of complex service purchase choices being made with standard online decision tools – specifically common design features of such tools- and the interaction between the peculiar environmental contexts that the user is at while making such decisions and the decision tool.

This study extends research investigating the decoy effect by demonstrating the differences in options chosen when asymmetrically dominated alternatives differ in terms of the price increase with the same change in utility. It further extends this research by showing the moderating effects of perceived risk and decision approach and how this moderation is bounded by different levels of change in price in the anchor options.

It extends options framing and price order effect to comparisons of choice sets presented as lists of full items vs. customizable options and it shows that option framing and price order effect will differ even if in both conditions the alternatives begin with the lowest price. Furthermore, it extends research concerning the moderating effect of option importance to conditions where the options available may be of interest to the user, yet reference dependence remains robust. It also demonstrates the moderating effects of perceived risk and decision approach on reference dependence that the consumer is subject to. It shows that reference dependence may still hold even for users in specific conditions and with clear decision approaches – although their ultimate decisions may still differ. Furthermore, prior research has argued that price order effect should only occur with choice sets assuming price-quality relationship (Diehl et al., 2003; Suk et al., 2012). In this study, neither of the choice sets assumes such a relationship, however it does assume price-utility association, which also significantly impacts user's decision.

The study extends research concerning the boundaries of loss aversion research by examining the moderating effect of decision context on decoy effect, price order effect, and options framing as well as the moderating impact of decision approach on loss aversion. It extends the findings of (Novemsky & Kahneman, 2005) indicating that intention moderates loss aversion, to conditions influencing preference creation and decision approach which the decision maker undertakes when making the choice. It further contributes to the research of (Koszegi & Rabin, 2006) who posited that the reference point may not be current endowment (thus the transaction would not entail loss aversion) but expected endowment.

Furthermore, it contributes to scholarship concerning consumer behavior under perceived risk, specifically health insurance choices under risk, by furthering our understanding of the decisions which consumers make in the online environment under low and under high perceived risk. It extends extant research by examining the distinct choices for healthcare coverage the consumers make and the prices they pay when choosing from a set of options, or, alternatively, when customizing the plan, online.

At a practical level the study informs consumers about the potential consequences of the choices they make while purchasing items online. It educates the public of possible ramifications to the quality of decisions they make with the support of online tools in different circumstances, they may find themselves in, in their everyday lives. Particularly, it demonstrates that a consumer purchasing an item such as health insurance with the support of a non-compensatory online decision tool under high perceived risk, may overspend. It is advisable that - for users wishing to minimize the price they pay - the purchases done in situations of increased perceived risk should be carried out with customization-based decision tools, as the price paid for health plans with those types of tools is lower. It is further conceivable that providers attempting to stimulate their sales, may potentially misuse the design and output characteristics of non-compensatory tools and leave consumers vulnerable. The negative impact that of the design of non-compensatory tools and their output characteristics – whether unintentional (embedded naturally in the tool) or deliberate – calls for a reconsideration of decision tool design and possible standardization of such tools in certain domains and industries.

## 7.2 Limitations

Study 1 and study 2 and the findings they have uncovered are both subject to several limitations.

Firstly, the choice sets adopted in the studies have specific characteristics in terms of the way they are priced and their respective utilities, which may not always be the case in outputs generated by non-compensatory tools online. In study 1 the topmost alternative is established purposely as an anchor and in study 2 the alternatives increase gradually in terms of both the prices and utilities. In the online setting the characteristics of the output (in terms of changes and gaps across prices and the extent and characteristics of the utilities offered) will vary across websites and available inventory at hand by the merchants. The case of pricing will also differ depending on whether the website is provided and managed by the supplier or vendor. Arguably, alternatives offered directly by the supplier may be associated with one another in terms of pricing; while the pricing of options aggregated from various suppliers may be rather unrelated and, thus, generated as a single output of a non-compensatory tool, provided by a vendor, may be more unsystematic. Although this study has adopted robust effects of anchoring, price order effect, and options framing to explain the dynamics of price sort in a non-compensatory tool and the characteristics of their output, further research is required for us to fully understand these mechanisms. Moreover, the choice sets are focused around a single health condition which, although necessary to examine the effects under study (to show users' choices with regards to the coverage while under high perceived risk for a particular adverse outcome), are not entirely reflective of actual health plans offered in the industry.

Furthermore, the customization tool also examines the choice set as precisely equivalent to the non-compensatory ascending tool. Although this is necessary to demonstrate the effectiveness of the tool to mitigate the negative impact of the non-compensatory tool on user's decision quality, the industry may not always offer such alternatives. The effectiveness of the customization tool in terms of mitigating overspending, may be therefore limited to the choice set characteristics.

Secondly, the choice set size was fixed in both studies, although possible number of options generated by online decision tools and offered by providers can easily go beyond that. Consumers facing a vast number of alternatives are subject to information overload and adopt heuristic processing to manage the options. On the one hand, it can be argued that in such circumstances the effect of anchors and price sort in non-compensatory and customization tools on user choices will hold. On the other hand, it is conceivable that users in different situations, driven by specific motivations, for instance highly involved in the purchase activity, should be more inclined into thoroughly considering further options in the choice set. In this case the effect of anchors could potentially dissipate, as with deliberation of more options, the user may be more likely to choose one of the options further down from the anchor. The effect of purchase task involvement might possibly amplify the effect of cost-utility analysis in non-compensatory and customization tools, as the user would be more committed into this manner of considering the options. The effect of anchors, non-compensatory and customization tools might also differ for users with clearly established preferences or set budgets. Those users might be less susceptible to heuristics and may not examine the options in terms of their costs and respective utilities, but rather search for options that fit with their individual objectives.

Thirdly, by focusing on output characteristics, this study tests non-compensatory tools in a given, pre-established format. The non-compensatory tool is studied in two conditions: descending and ascending price order; and the customization tool is studied in a single condition, whereby the attribute packages are listed in an equivalent manner to the non-compensatory ascending tool (starting with the lowest level of attributes). The study does not take into account the motivations to utilize different tools available and *how* to use them – for instance, users may differ in their choices to use a non-compensatory tool and sort by price either in descending or ascending fashion, and, therefore, obtain different formats of the output.

Fourthly, the decision tools examined here are simplified – the functionality embedded in the non-compensatory tool enables the user not only just to sort but also to sort only price, while the customization tool only lets the user pick and choose packages to customize one out of possible 10 alternatives. Neither the non-compensatory nor the customization tool studied here has any other functionalities which would facilitate the decision-making process for the user, such as filtering or sorting by any other factors. This simplification has been chosen for the purpose of the study to focus on those specific design features and output characteristics, however in the online environment greater complexity of tools is available, which could change the dynamics and the result of the choice.

Fifthly, the customization-based tool offered here as an alternative to the non-compensatory tool mitigates the effect of overspending which occurs when using the latter tool, however, it needs to be shown that it is not entirely behaviorally-neutral. Customization of the alternative out of attribute packages presented beginning from the

package with utility equivalent to the lowest option in the ascending tool also subjects the user to reference dependence, similarly to the non-compensatory tool.

Finally, the experimental design adopted for the purpose of the study involved a scenario which also sets limitations to the interpretation of the findings. The participants during the experiment were instructed to imagine themselves in a situation as per the scenario and to make their purchase choice as if they were in such circumstances. This raises a question to what extent were the participants able to imagine themselves in such a situation and to what extent was their choice indeed reflective of the choice they would make in their lives.

Furthermore, the participants during the experiments were not given a budget to keep in mind while making the purchase choice- there was no mention of budget or income in the instructions. In their everyday lives, consumers are likely to be impacted by their incomes, which could, in turns affect their decisions even when presented with options in such a way that evoke reference dependence.

## 7.3 Further research recommendations

This study represents one of minority of studies examining at a detailed level the effect of online decision tool usage on user's decision quality within the contextual setting of the decision scenario and the interaction between the tool and the user at the cognitive level. It constitutes a necessary step in our understanding of the dynamics of online decision tools and, particularly, the differential impact that information delivery embedded in decision tool design and output characteristics can have on user's choices. The study also constitutes one of a minority of studies specifically focusing on non-compensatory designs. Further research is needed, however, to examine this phenomenon in order for us to fully

understand the interaction between the user and the decision tool, so that we can provide effective decision tool designs.

Future research should investigate the conditions that can amplify or diminish the effects of anchoring and reference dependence and change the impact of the tool on user's decision quality. User's personal characteristics such as task commitment or item involvement may be investigated as possible elements that can change the way the user cross-examines the alternatives and, ultimately, influence their decision. Different environmental/situational factors may also be studied, with varying levels of uncertainty of user's preferences. There is also a need for further studies that would attempt to offer further tool designs which could mitigate the negative effect of reference dependence on user's decision quality. It is imperative that decision tool design takes into consideration user's individual and environmental factors and is maximally tailored to the user's purchase task in order to support less biased decision making.

Accordingly, additional studies are needed which would examine the role of user's heuristics and biases in their interaction with the decision tool, and, how such cognitive limitations can be evoked by different forms of decision tool design or user's information processing. Interesting phenomena can include user's heuristic processing when making the choice with non-compensatory tools, framing effects, which can be induced by information presentation, or selection bias possible to occur when examining the choice set.

There is a need for additional research that would inspect not only the impact of the tool on user's decision outcomes, but also research of *how* the decision tool is appropriated by the user. With increasing level of functionality of decision tools and a number of

capabilities for the user to choose from and how to use them, it is crucial that scholarship examines how such functions (such as how the user sorts – and/or by which factor) are utilized by the user, as those elements then influence output characteristics, and, possibly, the decision-making process. An interesting phenomenon would be *self-framing* (X. T. Wang, 2004) and possibly extending it in the decision tool design domain: for instance, users in different circumstances will use such design features differentially, for instance, users with higher income or, potentially, users who are motivated (for any reason) to pay a higher price for an item, may be more inclined to sort by price in descending fashion, or users who lack trust with online vendors, may be more inclined to sort by customer reviews.

## 7.4 Conclusion

This study investigates the role of output format, output content, decision tool design, decision context, and user's decision approach in user's decision quality. As the context of the purchase decision examined here is health insurance, for which consumers frequently adopt price heuristics, the element that this paper focuses on is price – aspects of information delivery and tool design related to the price of the alternatives. It shows that the different factors pertinent to an online purchase using non-compensatory and customization-based tools, can on the one hand, yield higher price paid or more extensive items purchased by the users, and on the other hand, mitigate such overspending effects.

The findings of this study indicate that the effectiveness of online decision tools is influenced not only by tool design but also by the item search output characteristics, user's cognition, as well as the individual circumstances in which the user is at. Drawing from relative pricing literature, this study shows that non-compensatory tools which enable the user to sort by price, may subject the user to reference dependence, thus, having a negative

impact on their decision quality. Users making their purchase choice with a non-compensatory tool sorting by price in a descending fashion pays a higher price than users making their decision when the alternatives are sorted in an ascending manner. Usage of a customization-based tool further positively impacts the user's decision quality by mitigating this overspending effect. In conclusion, decision tools can have a substantial effect on users' choices which can result in different prices paid and varying items being purchased. Decision tool design, which has so far been very extensively discussed in the information systems literature, is not the only element which can affect decision quality. Users' online choices are impacted by the components of the decision tool supporting the different stages of the decision-making process as well as by the user and their circumstances.

Furthermore, the decision approach the user takes up when making the choice can further amplify the effect of the non-compensatory tool enabling the user to sort by price, by moderating the reference dependence embedded in it.

Output characteristics of online decision tools, which depend on the tool design and/or the specifics of the choice set itself, can also impact purchase choices that the user makes.

Last, but not least, this study shows the complexity of moderating the effects of reference dependence, which a consumer can be subject to, for instance in the online environment. As much as the circumstances of the user can contribute to their preference creation, and in such situations (when considering a choice set with limited number of relatable alternatives), reference dependence can be reduced. Additionally, the results of this study showed a significant moderation of reference dependence by the user's decision approach – being weakly driven by price heuristics, contrary to the hypothesized argument.

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APPENDICES

APPENDIX 1 STUDY 1 DECISION APPROACH FACTOR ANALYSIS

Results of factor analysis for decision approach in Study 1 are presented in Tables 92-97 and Figure 32 below.

| KMO and Bartlett's Test | | |
|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy | | .688 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 506.631 |
| | df | 6 |
| | Sig. | .00000000 |

*Table 92 KMO and Bartlett's test - decision approach in Study 1.*

| Correlation Matrix | | | | | |
|---|---|---|---|---|---|
| | | I relied completely on price. | All that mattered was minimizing cost I would incur. | I wasn't concerned about coverage benefits at all. | The coverage benefits didn't matter at all. |
| Correlation | I relied completely on price. | 1.000 | .659 | .564 | .542 |
| | All that mattered was minimizing cost I would incur. | .659 | 1.000 | .355 | .430 |
| | I wasn't concerned about coverage benefits at all. | .564 | .355 | 1.000 | .732 |
| | The coverage benefits didn't matter at all. | .542 | .430 | .732 | 1.000 |
| Sig. (1-tailed) | I relied completely on price. | | .000 | .000 | .000 |

| | | | | | |
|---|---|---|---|---|---|
| | All that mattered was minimizing cost I would incur. | .000 | | .000 | .000 |
| | I wasn't concerned about coverage benefits at all. | .000 | .000 | | .000 |
| | The coverage benefits didn't matter at all. | .000 | .000 | .000 | |

*Table 93 Correlation matrix for decision approach in Study 1.*

| Communalities | | |
|---|---|---|
| | Initial | Extraction |
| I relied completely on price. | 1.000 | .726 |
| All that mattered was minimizing cost I would incur. | 1.000 | .543 |
| I wasn't concerned about coverage benefits at all. | 1.000 | .677 |
| The coverage benefits didn't matter at all. | 1.000 | .702 |
| Extraction Method: Principal Component Analysis. | | |

*Table 94 Communalities for decision approach in Study 1.*

| Total Variance Explained | | | | | | |
|---|---|---|---|---|---|---|
| | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | |
| Component | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1 | 2.648 | 66.201 | 66.201 | 2.648 | 66.201 | 66.201 |
| 2 | .779 | 19.473 | 85.674 | | | |
| 3 | .334 | 8.357 | 94.030 | | | |
| 4 | .239 | 5.970 | 100.000 | | | |
| Extraction Method: Principal Component Analysis. | | | | | | |

*Table 95 Total variance explained for decision approach in Study 1.*

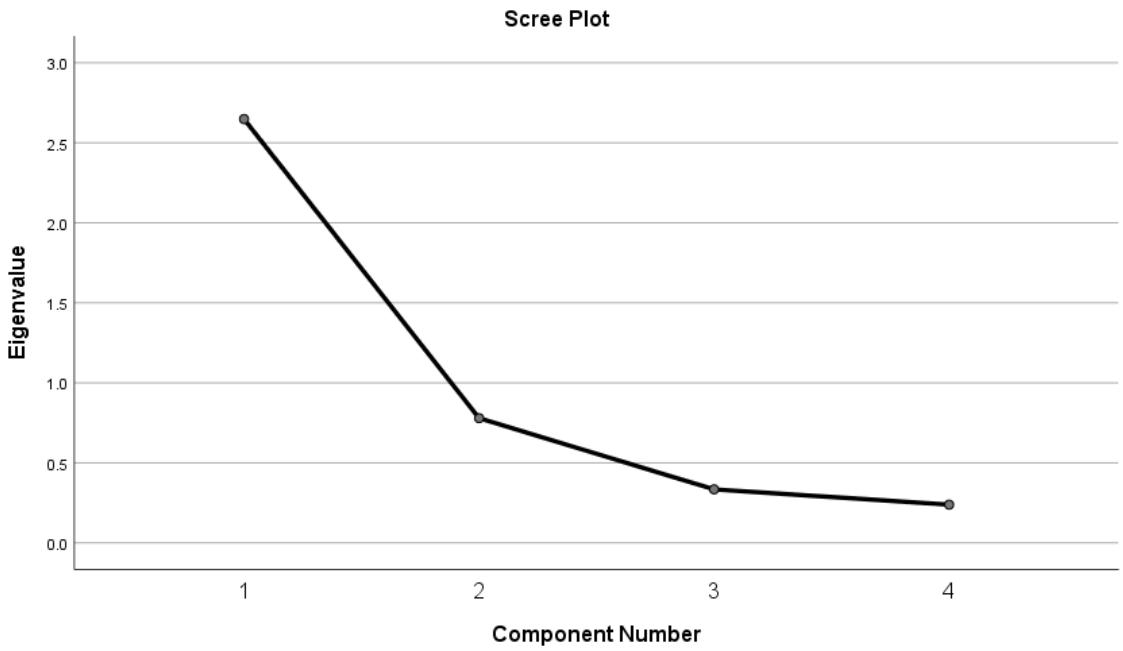


*Figure 32 Scree plot for decision approach in Study 1.*

| Component Matrix[a] | |
|---|---|
| | Component |
| | 1 |
| I relied completely on price. | .852 |
| All that mattered was minimizing cost I would incur. | .737 |
| I wasn't concerned about coverage benefits at all. | .823 |
| The coverage benefits didn't matter at all. | .838 |
| Extraction Method: Principal Component Analysis.<br>a. 1 components extracted. | |

*Table 96 Component matrix for decision approach in Study 1.*

| Reliability Statistics | |
|---|---|
| Cronbach's Alpha | N of Items |
| .825 | 4 |

*Table 97 Cronbach's alpha for decision approach in Study 1.*

KMO for all the items was .688 and Bartlett's Test of Sphericity was 506.631, p=.00000. Cronbach's Alpha for the measure reached a satisfactory .825 indicating the measure is internally consistent (Haif, Ringle, & Sarstedt, 2011).

To measure price heuristics driven decision approach, four items (as indicated in the analysis above) were used:

Just now, when I was choosing the health plan:

I relied completely on price. – I didn’t rely on price at all.

All that mattered was minimizing cost I would incur. - minimizing cost I would incur didn’t matter at all.

I wasn’t concerned about coverage benefits at all. – I was only concerned with coverage benefits.

The coverage benefits didn’t matter at all. – The coverage benefits were all that mattered.

APPENDIX 2 STUDY 1 EXPERIMENTAL TASK INVOLVEMENT & MANIPULATIONS

It was examined whether there was any difference in terms of plan purchased across the respondents who varied in their involvement with reading the Perceived Risk scenario (measured as correct answers provided). No significant difference was found. Results are shown below in tables 98-99.

| CROSSTABULATION RESULTS: Plan Purchased * Perceived Risk Scenario Involvement | | | | | |
|---|---|---|---|---|---|
| | | Perceived Risk Scenario Involvement | | | |
| Plan Purchased | | 0/2 Answers Correct | 1/2 Answer Correct | 2/2 Answers Correct | Total |
| Golden Plus | Count | 6a | 13a | 27a | 46 |
| | Residual | .6 | -4.8 | 4.2 | |
| Golden | Count | 10a | 37a | 48a | 95 |
| | Residual | -1.2 | .3 | .8 | |
| Silver & Other | Count | 16a | 55a | 60a | 131 |
| | Residual | .6 | 4.4 | -5.0 | |
| Each subscript letter denotes a subset of Perceived Risk Scenario Involvement categories whose column proportions do not differ significantly from each other at the .05 level | | | | | |
| **Linear-by-Linear Association** (1, N=272) = 1.188, (Exact sig.) p =.287 | | | | | |

*Table 98 Crosstabulation of plans chosen across scenario involvement in Study 1.*

It was examined whether there was any difference in terms of plan purchased across the respondents who varied in their involvement with reading the informational text pertaining to skin cancer – Knowledge of Adverse Outcome text (measured as correct answers provided). No significant difference was found. Results are shown below in tables 100-101.

| CROSSTABULATION RESULTS: Plan Purchased * Knowledge of Adverse Outcome Involvement | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | Knowledge of Adverse Outcome Involvement | | | | | |
| Plan Purchased | | 0/4 Answers Correct or 5/4 | 1/4 Answer Correct | 2/4 Answers Correct | 3/4 Answers Correct | 4/4 Answers Correct | Total |
| Golden Plus | Count | 2a | 3a | 9a | 10a | 22a | 46 |
| | Residual | -1.7 | 1.8 | .7 | -5.2 | 4.4 | |
| Golden | Count | 6a | 2a | 14a | 37a | 36a | 95 |
| | Residual | -1.7 | -.4 | -3.1 | 5.6 | -.3 | |
| Silver & Other | Count | 14a | 2a | 26a | 43a | 46a | 272 |
| | Residual | 3.4 | -1.4 | 2.4 | -.3 | -4.1 | |
| Each subscript letter denotes a subset of Perceived Risk Scenario Involvement categories whose column proportions do not differ significantly from each other at the .05 level | | | | | | | |
| **Linear-by-Linear Association** (1, N=272) = 1.761, (Exact sig.) p =.190 | | | | | | | |

*Table 99 Crosstabulation - plans chosen across Knowledge of Adverse Outcome Involvement Study 1.*

It was examined whether there was any difference in terms of perceived risk across the respondents who varied in their involvement with reading the Perceived Risk scenario (measured as correct answers provided). No significant difference was found. Results are shown below in tables 102-103.

| Test of Homogeneity of Variances | | | | | |
|---|---|---|---|---|---|
| | | Levene Statistic | df1 | df2 | Sig. |
| Perceived Risk | Based on Mean | 2.614 | 2 | 286 | .075 |
| | Based on Median | 2.078 | 2 | 286 | .127 |
| | Based on Median and with adjusted df | 2.078 | 2 | 276.441 | .127 |
| | Based on trimmed mean | 2.901 | 2 | 286 | .057 |

*Table 100 Homogeneity of variances test of perceived risk across scenario involvement Study 1.*

| ANOVA RESULTS (DV: Perceived Risk) | | | | | |
|---|---|---|---|---|---|
| Source | Type III Sum of Squares | df | Mean Square | F | Sig. |
| Between Groups | 35.285 | 2 | 17.642 | 2.645 | .073 |
| Within Groups | 1907.317 | 286 | 6.669 | | |
| Total | 1942.602 | 288 | | | |

*Table 101 ANOVA for perceived risk across Scenario Involvement in Study 1.*

It was examined whether there was any difference in terms of perceived risk across the respondents who varied in their involvement with reading the informational text pertaining to skin cancer – Knowledge of Adverse Outcome text (measured as correct answers provided). No significant difference was found. Results are shown below in tables 104-105.

| Test of Homogeneity of Variances | | | | | |
|---|---|---|---|---|---|
| | | Levene Statistic | df1 | df2 | Sig. |
| Perceived Risk | Based on Mean | 1.374 | 4 | 283 | .243 |
| | Based on Median | 1.023 | 4 | 283 | .396 |
| | Based on Median and with adjusted df | 1.023 | 4 | 275.504 | .396 |
| | Based on trimmed mean | 1.367 | 4 | 283 | .245 |

*Table 102 Homogeneity of variances test for perceived risk across Knowledge of Adverse Outcome Involvement in Study 1.*

| ANOVA RESULTS (DV: Perceived Risk) | | | | | |
|---|---|---|---|---|---|
| Source | Type III Sum of Squares | df | Mean Square | F | Sig. |
| Between Groups | 28.700 | 4 | 7.175 | 1.069 | .372 |
| Within Groups | 1899.018 | 283 | 6.710 | | |
| Total | 1927.719 | 287 | | | |

*Table 103 ANOVA for perceived risk across Knowledge of Adverse Outcome Involvement in Study 1.*

APPENDIX 3 STUDY 1 EXPERIMENTAL MANIPULATIONS ACROSS DATA SOURCES

It was examined whether there was any difference in terms of perceived risk (tables 106-107) and plan purchased (108-109) across the respondents joining the experiment from different locations. There was a significant difference p=.003 across the data sources in terms of perceived risk, however there was no significant difference in terms of price paid. The pair of data sources significantly different from each other by perceived risk include Students at FIU and respondents from AMT (also largest groups).

Kruskal-Wallis test for perceived risk.

| Independent-Samples Kruskal-Wallis Test Summary (DV: Perceived Risk) | |
|---|---|
| Total N | 289 |
| Test Statistic | 15.876[a] |
| Degree of Freedom | 4 |
| Asymptotic Sig. (2-sided test) | .003 |
| a. The test statistic is adjusted for ties. | |

*Table 104 Kruskal-Wallis result for perceived risk across data sources in Study 1.*

| Pairwise Comparisons of Data Sources | | | | | | |
|---|---|---|---|---|---|---|
| Dependent Variable: Perceived Risk | | | | | | |
| Sample 1 | Sample 2 | Test Statistic | Std. Error | Std. Test Statistic | Sig. | Adj. Sig.[a] |
| AIS World | University 1 | 62.319 | 60.270 | 1.034 | .301 | 1.000 |
| AIS World | Amazon Mechanical Turk | 112.673 | 58.899 | 1.913 | .056 | .557 |
| AIS World | Social Media | 133.500 | 82.962 | 1.609 | .108 | 1.000 |

| | | | | | | |
|---|---|---|---|---|---|---|
| AIS World | University 2 | 180.500 | 101.607 | 1.776 | .076 | .757 |
| University 1 | Amazon Mechanical Turk | -50.354 | 14.797 | -3.403 | .001 | .007 |
| University 1 | Social Media | -71.181 | 60.270 | -1.181 | .238 | 1.000 |
| University 1 | University 2 | -118.181 | 84.106 | -1.405 | .160 | 1.000 |
| AMT | Social Media | -20.827 | 58.899 | -.354 | .724 | 1.000 |
| AMT | University 2 | 67.827 | 83.129 | .816 | .415 | 1.000 |
| Social Media | University 2 | 47.000 | 101.607 | .463 | .644 | 1.000 |
| Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.<br>Asymptotic significances (2-sided tests) are displayed. The significance level is .05.<br>a. Significance values have been adjusted by the Bonferroni correction for multiple tests. | | | | | | |

*Table 105 Pairwise comparisons for perceived risk across data sources in Study 1.*

Crosstabs analysis for plan purchased.

| CROSSTABULATION RESULTS: Plan Purchased * Data Source | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | Data Source | | | | | |
| Plan Purchased | | University 1 | University 2 | Amazon Mechanical Turk | Social Media | AIS World | Total |
| Golden Plus | Count | 5a | 0a | 40a | 1a | 0a | 46 |
| | Residual | | | | | | |
| Golden | Count | 12a | 0a | 82a | 1a | 0a | 95 |
| | Residual | | | | | | |
| Silver & Other | Count | 15a | 1a | 113a | 1a | 1a | 131 |
| | Residual | | | | | | |
| Each subscript letter denotes a subset of Data Source categories whose column proportions do not differ significantly from each other at the .05 level | | | | | | | |
| **Linear-by-Linear Association** (1, N=272) = .006, (Exact sig.) p =.967 | | | | | | | |

*Table 106 Crosstabulation for plan purchased across data sources in Study 1.*

APPENDIX 4 STUDY 2 DECISION APPROACH FACTOR ANALYSIS

Results of factor analysis for decision approach in Study 2 are presented below in tables 110-115 and Figure 33.

| KMO and Bartlett's Test | | |
|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy | | .674 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 473.978 |
| | df | 6 |
| | Sig. | .00000000 |

*Table 107 KMO and Bartlett's test - decision approach in Study 2.*

| Correlation Matrix | | | | | |
|---|---|---|---|---|---|
| | | I relied completely on price. | All that mattered was minimizing cost I would incur. | I wasn't concerned about coverage benefits at all. | The coverage benefits didn't matter at all. |
| Correlation | I relied completely on price. | 1.000 | .607 | .537 | .517 |
| | All that mattered was minimizing cost I would incur. | .607 | 1.000 | .338 | .338 |
| | I wasn't concerned about coverage benefits at all. | .537 | .338 | 1.000 | .805 |
| | The coverage benefits didn't matter at all. | .517 | .338 | .805 | 1.000 |
| Sig. (1-tailed) | I relied completely on price. | | .000 | .000 | .000 |

| | | | | | |
|---|---|---|---|---|---|
| | All that mattered was minimizing cost I would incur. | .000 | | .000 | .000 |
| | I wasn't concerned about coverage benefits at all. | .000 | .000 | | .000 |
| | The coverage benefits didn't matter at all. | .000 | .000 | .000 | |

*Table 108 Correlation matrix for decision approach in Study 2.*

| Communalities | | |
|---|---|---|
| | Initial | Extraction |
| I relied completely on price. | 1.000 | .680 |
| All that mattered was minimizing cost I would incur. | 1.000 | .460 |
| I wasn't concerned about coverage benefits at all. | 1.000 | .729 |
| The coverage benefits didn't matter at all. | 1.000 | .717 |
| Extraction Method: Principal Component Analysis. | | |

*Table 109 Communalities for decision approach in Study 2.*

| Total Variance Explained | | | | | | |
|---|---|---|---|---|---|---|
| | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | |
| Component | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1 | 2.586 | 64.650 | 64.650 | 2.586 | 64.650 | 64.650 |
| 2 | .868 | 21.695 | 86.345 | | | |
| 3 | .352 | 8.800 | 95.145 | | | |
| 4 | .194 | 4.855 | 100.00 | | | |
| Extraction Method: Principal Component Analysis. | | | | | | |

*Table 110 Total variance explained - decision approach in Study 2.*

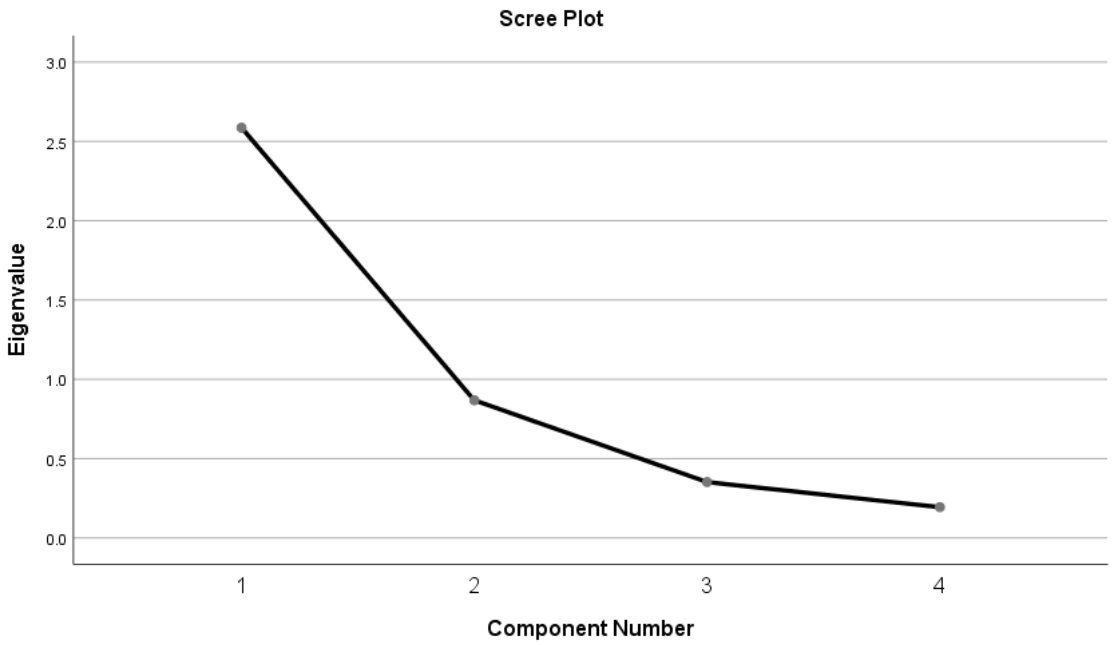


*Figure 33 Scree plot for decision approach in Study 2.*

| Component Matrix[a] | |
|---|---|
| | Component |
| | 1 |
| I relied completely on price. | .825 |
| All that mattered was minimizing cost I would incur. | .678 |
| I wasn't concerned about coverage benefits at all. | .854 |
| The coverage benefits didn't matter at all. | .847 |
| Extraction Method: Principal Component Analysis.<br>a. 1 components extracted. | |

*Table 111 Component matrix for decision approach in Study 2.*

| Reliability Statistics | |
|---|---|
| Cronbach's Alpha | N of Items |
| .811 | 4 |

*Table 112 Cronbach's alpha for decision approach in Study 2.*

KMO for all the items was .674 and Bartlett's Test of Sphericity was 473.978, p=.00000. Cronbach's Alpha for the measure reached a satisfactory .811 indicating the measure is internally consistent (Haif et al., 2011).

To measure price heuristics driven decision approach, four items were used (as indicated in the analysis above):

Just now, when I was choosing the health plan:

I relied completely on price. – I didn't rely on price at all.

All that mattered was minimizing cost I would incur. - minimizing cost I would incur didn't matter at all.

I wasn't concerned about coverage benefits at all. – I was only concerned with coverage benefits.

The coverage benefits didn't matter at all. – The coverage benefits were all that mattered.

APPENDIX 5 STUDY 2 EXPERIMENTAL TASK INVOLVEMENT & MANIPULATIONS

It was examined whether there was any difference in terms of price paid across the respondents who varied in their involvement with reading the Perceived Risk scenario (measured as correct answers provided). No significant difference was found. Results are shown below in tables 116-117.

| Test of Homogeneity of Variances | | | | | |
|---|---|---|---|---|---|
| | | Levene Statistic | df1 | df2 | Sig. |
| Perceived Risk | Based on Mean | 1.422 | 2 | 257 | .243 |
| | Based on Median | 1.495 | 2 | 257 | .226 |
| | Based on Median and with adjusted df | 1.495 | 2 | 256.820 | .226 |
| | Based on trimmed mean | 1.444 | 2 | 257 | .238 |

*Table 113 Homogeneity of variances test - price paid across scenario involvement in Study 2.*

| ANOVA RESULTS (DV: Price Paid) | | | | | |
|---|---|---|---|---|---|
| Source | Type III Sum of Squares | df | Mean Square | F | Sig. |
| Between Groups | 17196.449 | 2 | 8598.225 | 1.198 | .303 |
| Within Groups | 1844082.292 | 257 | 7175.417 | | |
| Total | 1861278.741 | 259 | | | |

*Table 114 ANOVA result for price paid across scenario involvement in Study 2.*

It was examined whether there was any difference in terms of price paid across the respondents who varied in their involvement with reading the informational text pertaining to skin cancer – Knowledge of Adverse Outcome text (measured as correct answers

provided). No significant difference was found. Results are shown below in tables 118-119.

| Test of Homogeneity of Variances | | | | | |
|---|---|---|---|---|---|
| | | Levene Statistic | df1 | df2 | Sig. |
| Perceived Risk | Based on Mean | .273 | 4 | 255 | .896 |
| | Based on Median | .168 | 4 | 255 | .954 |
| | Based on Median and with adjusted df | .168 | 4 | 248.500 | .954 |
| | Based on trimmed mean | .272 | 4 | 255 | .896 |

*Table 115 Homogeneity of variances test - price paid across Knowledge of Adverse Outcome Involvement in Study 2.*

| ANOVA RESULTS (DV: Price Paid) | | | | | |
|---|---|---|---|---|---|
| Source | Type III Sum of Squares | df | Mean Square | F | Sig. |
| Between Groups | 52500.955 | 4 | 13125.329 | 1.850 | .120 |
| Within Groups | 180.08777.786 | 255 | 7093.246 | | |
| Total | 1861278.741 | 259 | | | |

*Table 116 ANOVA result for prices paid across Knowledge of Adverse Outcome Involvement in Study 2.*

It was examined whether there was any difference in terms of perceived risk (tables 120-121) across the respondents who varied in their involvement with reading the informational text pertaining to skin cancer – Knowledge of Adverse Outcome text (measured as correct answers provided). There was a significant difference, however, adjusted significance values did not show any significant differences (significance level differences were found between 1/4 and 3/4 and 1/4/ and 4/4).

| Independent-Samples Kruskal-Wallis Test Summary (DV: Perceived Risk) | |
|---|---|
| Total N | 259 |
| Test Statistic | 9.945 |
| Degree of Freedom | 4 |
| Asymptotic Sig. (2-sided test) | .041 |
| a. The test statistic is adjusted for ties. | |

*Table 117 Kruskal-Wallis result for perceived risk across Knowledge of Adverse Outcome Involvement in Study 2.*

| Pairwise Comparisons of Knowledge of Adverse Outcome Involvement | | | | | | |
|---|---|---|---|---|---|---|
| Dependent Variable: Perceived Risk | | | | | | |
| Sample 1 | Sample 2 | Test Statistic | Std. Error | Std. Test Statistic | Sig. | Adj. Sig.[a] |
| 1/4 Answer Correct | 0/4 Answers Correct or 5/4 | 41.336 | 30.766 | 1.344 | .179 | 1.000 |
| 1/4 Answer Correct | 2/4 Answers Correct | -50.230 | 26.087 | -1.925 | .054 | .542 |
| 1/4 Answer Correct | 3/4 Answers Correct | -65.764 | 24.691 | -2.663 | .008 | .077 |
| 1/4 Answer Correct | 4/4 Answers Correct | -68.394 | 24.691 | -2.770 | .006 | .056 |
| 0/4 Answers Correct or 5/4 | 2/4 Answers Correct | -8.895 | 22.865 | -.389 | .697 | 1.000 |
| 0/4 Answers Correct or 5/4 | 3/4 Answers Correct | -24.428 | 21.258 | -1.149 | .251 | 1.000 |
| 0/4 Answers Correct or 5/4 | 4/4 Answers Correct | -27.058 | 21.258 | -1.273 | .203 | 1.000 |
| 2/4 Answers Correct | 3/4 Answers Correct | -15.533 | 13.635 | -1.139 | .255 | 1.000 |
| 2/4 Answers Correct | 4/4 Answers Correct | -181.64 | 13.635 | -1.332 | .183 | 1.000 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 3/4 Answers Correct | 4/4 Answers Correct | -2.630 | 10.725 | -.245 | .806 | 1.000 |

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.
Asymptotic significances (2-sided tests) are displayed. The significance level is .05.
a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

*Table 118 Pairwise comparisons for perceived risk across Knowledge of Adverse Outcome Involvement in Study 2.*

It was examined whether there was any difference in terms of perceived risk across the respondents who varied in their involvement with reading the Perceived Risk scenario (measured as correct answers provided). No significant difference was found. Results are shown below in tables 122-123.

| Test of Homogeneity of Variances | | | | | |
|---|---|---|---|---|---|
| | | Levene Statistic | df1 | df2 | Sig. |
| Perceived Risk | Based on Mean | .576 | 2 | 256 | .563 |
| | Based on Median | .662 | 2 | 256 | .517 |
| | Based on Median and with adjusted df | .662 | 2 | 251.335 | .517 |
| | Based on trimmed mean | .618 | 2 | 256 | .540 |

*Table 119 Homogeneity of variances test for ANOVA for perceived risk across scenario involvement.*

| ANOVA RESULTS (DV: Perceived Risk) | | | | | |
|---|---|---|---|---|---|
| Source | Type III Sum of Squares | df | Mean Square | F | Sig. |
| Between Groups | 23.377 | 2 | 11.688 | 2.038 | .132 |
| Within Groups | 1468.013 | 256 | 5.734 | | |
| Total | 1491.390 | 258 | | | |

*Table 120 ANOVA result for perceived risk across scenario involvement.*

APPENDIX 6 STUDY 2 EXPERIMENTAL MANIPULATIONS ACROSS DATA SOURCES

It was examined whether there was any difference in terms of price paid across the respondents joining the experiment from different locations. No significant difference was found. Results are shown in tables 124-125 below.

| Test of Homogeneity of Variances | | | | | |
|---|---|---|---|---|---|
| | | Levene Statistic | df1 | df2 | Sig. |
| Perceived Risk | Based on Mean | 1.202 | 2 | 254 | .302 |
| | Based on Median | .905 | 2 | 254 | .406 |
| | Based on Median and with adjusted df | .905 | 2 | 252.839 | .406 |
| | Based on trimmed mean | 1.211 | 2 | 254 | .300 |

*Table 121 Homogeneity of variances test - price paid across data sources in Study 2.*

| ANOVA RESULTS (DV: Price Paid) | | | | | |
|---|---|---|---|---|---|
| Source | Type III Sum of Squares | df | Mean Square | F | Sig. |
| Between Groups | 54862.605 | 5 | 10972.521 | 1.543 | .177 |
| Within Groups | 1806416.1 | 254 | 7111.875 | | |
| Total | 1861278.7 | 259 | | | |

*Table 122 ANOVA result for price paid across data sources in Study 2.*

It was examined whether there was any difference in terms of perceived risk across the respondents joining the experiment from different locations (Tables 126-127). No significant difference was found.

| Test of Homogeneity of Variances | | | | |
|---|---|---|---|---|
| | Levene Statistic | df1 | df2 | Sig. |

| | | | | | |
|---|---|---|---|---|---|
| Perceived Risk | Based on Mean | .170 | 2 | 253 | .843 |
| | Based on Median | .115 | 2 | 253 | .891 |
| | Based on Median and with adjusted df | .115 | 2 | 249.445 | .891 |
| | Based on trimmed mean | .159 | 2 | 253 | .854 |

*Table 123 Homogeneity of variances test - perceived risk across data sources Study 2.*

| ANOVA RESULTS (DV: Perceived Risk) | | | | | |
|---|---|---|---|---|---|
| Source | Type III Sum of Squares | df | Mean Square | F | Sig. |
| Between Groups | 55.834 | 5 | 11.167 | 1.968 | .084 |
| Within Groups | 1435.556 | 253 | 5.674 | | |
| Total | 1491.390 | 258 | | | |

*Table 124 ANOVA result for perceived risk across data sources in Study 2.*

# VITA

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| | |
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## PUBLICATIONS AND PRESENTATIONS

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Xia, W., Kolotylo, M. and Tan, X. (October, 2016). *Factors Affecting General Practitioners Transfer of Specialized Self-Care Knowledge to Patients.* Paper presented at the International Conference on Knowledge Management and Innovation, New York, NY.