Valuing a reduction in the risk of skin sensitisation

A large scale multi-country stated preference approach

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Table of contents

Tables

Figures

Boxes

Abstract

Skin sensitisation can be associated with a wide range of chemicals found in everyday products, including cosmetics, clothes, and metals. However, economic estimates of the benefits of reducing skin sensitisation risk remain scarce.

This paper is part of the series of large-scale willingness-to-pay (WTP) studies resulting from the Surveys on Willingness-to-pay to Avoid Negative Chemicals-Related Health Effects (SWACHE) project that intends to improve the basis for performing cost-benefit analyses of chemicals management options and environmental policies in general. The present paper details a stated preference survey estimating WTP to avoid the frequency, severity, and visibility of skin flare-ups. The survey was fielded in 9 countries: Canada, Denmark, Japan, the Netherlands, Poland, Spain, Switzerland, the United Kingdom, and the United States. In each country, a representative sample of 1 200 respondents from the general population was surveyed, including medically diagnosed skin-sensitised individuals and non-sensitised individuals.

The results show that valuation varies by flare-up characteristics. Among skin-sensitised respondents, mean WTP over five years to avoid a severe two-week facial flare-up is USD_{2023} PPP 542, compared with USD_{2023} PPP 195 for an equivalent non-visible flare-up. For non-sensitised respondents, the corresponding values of a statistical case are USD_{2023} PPP 4 441 and USD_{2023} PPP 1 912.

Keywords: skin sensitisation, health risk, economic valuation, health valuation, morbidity valuation, monetised benefits, chemicals regulation, non-market valuation, stated preferences, surveys, willingness-to-pay, value of statistical case.

JEL Codes: D61, I18, J17, K32, Q51, Q53, Q58

Résumé

Les réactions cutanées peuvent être associées à un large éventail de substances chimiques présentes dans de nombreux produits du quotidien, notamment les cosmétiques, les vêtements et les métaux. Cependant, les estimations économiques des bénéfices liés à la réduction du risque de réactions cutanées demeurent rares.

Ce document fait partie d'une série d'études portant sur le consentement à payer et réalisées à grande échelle dans le cadre du projet SWACHE (Enquêtes sur le consentement à payer pour éviter les effets négatifs sur la santé dus à l'exposition aux composés chimiques). Ce projet vise à améliorer la réalisation des analyses coûts-bénéfices des options de gestion des produits et composés chimiques et des politiques environnementales en général. Le présent document détaille une enquête sur les préférences déclarées estimant le consentement à payer pour réduire le risque de réaction cutanée selon la fréquence, la gravité et la visibilité des poussées. L'enquête a été menée dans neuf pays : Canada, Danemark, Espagne, États-Unis, Japon, Pays-Bas, Pologne, Royaume-Uni et Suisse. Dans chacun des pays étudiés, un échantillon représentatif de 1 200 personnes a été interrogé et analysé, comprenant à la fois des individus médicalement diagnostiqués comme sensibilisés et des individus non sensibilisés.

Les résultats indiquent que les valeurs varient selon les caractéristiques des réactions cutanées. Pour les personnes sensibilisées, le consentement à payer sur une période de cinq ans pour éviter une réaction sévère de deux semaines sur le visage est estimé à 542 USD_{2023} en parité de pouvoir d'achat (PPA), contre 195 USD_{2023} PPA pour une poussée comparable située sur une partie non visible du corps. Pour les personnes non sensibilisées, les valeurs d'un cas statistique correspondantes sont estimées à 4 441 USD_{2023} PPA et à 1 912 USD_{2023} PPA.

Mots-clefs : réactions cutanées, risque pour la santé humaine, valorisation économique, valorisation de la santé, valorisation de la morbidité, bénéfices monétisés, réglementation des composés chimiques, valorisation non marchande, préférences déclarées, enquêtes, consentement à payer, valeur d'un cas statistique.

Classification JEL *:* D61, I18, J17, K32, Q51, Q53, Q58

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The SWACHE project is organised as a co-operation between the OECD Working Party on Integrating Environmental and Economic Policies (WPIEEP) under the Environmental Policy Committee (EPOC) and the Working Party on Risk Management (WPRM) under the Chemicals and Biotechnology Committee (CBC), and with the support of the SWACHE advisory group which includes experts in chemicals regulation, toxicology and economic valuation that was set up for this project.

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Executive Summary

Exposure to chemicals has been shown to cause skin sensitisation, leading to allergic contact dermatitis (ACD) and other dermatological conditions. It is tempting to view this outcome – or health endpoint – as perhaps less troubling for regulatory authorities given that this is not typically life-threatening. Yet for many of those who have skin sensitisation, the skin conditions that can result have a substantial bearing on quality of life and daily activities.

This includes physical discomfort and negative impacts on occupational productivity as well as psychological distress (Courtney and Su, 2024[1]; Kalboussi et al., 2019[2]). Moreover, incidence in the population – estimates for ACD alone are typically around 20% of adults (e.g. Alinaghi et al., 2019[3]) – indicates the potential pool of those who are sensitised is far from trivial. And those who are currently not affected by skin sensitisation clearly face risks of becoming so over their lifetimes especially given continued contact to allergens including chemicals in everyday items such as cosmetic products.

Yet authorities responsible for managing chemical sensitisers face a challenge where assessment of new proposals (such as banning skin-sensitising chemicals) requires comparisons of the monetary value of regulatory benefits with regulatory costs. In particular, the empirical record of the value that the public places on avoiding chemical-induced skin sensitisation remains limited.

The current study contributes to filling that gap in a substantial way. As part of the OECD Surveys of the Willingness to pay to Avoid Chemicals-related negative Health Effects (SWACHE) project, this paper provides the results of a survey that elicits people's willingness to pay (WTP) to avoid chemicals-related skin sensitisation. The survey was implemented across 9 countries: Canada, Denmark, Japan, the Netherlands, Poland, Spain, Switzerland, United Kingdom, and the United States. Representative samples of the general population were collected in each country, resulting in the analysis of 10 944 individual responses.

The specific contributions of the current study are at least two-fold.

First, it contributes new empirical evidence on the potential benefits of reducing exposure to skin-sensitising chemicals. The methodology also captures the valuation of different attributes of skin sensitisation such as the severity and location of a flare-up. Using these different components, the paper also illustrates how they can be combined in a hypothetical 2-week case of a skin sensitisation flare-up. While the empirical analysis was performed in the context of exposure to chemicals, the results are also expected to apply to valuation of reduced skin sensitisation outside of a chemicals context.

Second, the study explores a number of sources of heterogeneity, most notably how WTP differs between participants who state they are sensitised to at least some chemicals and those who are not. The paper also explores how other socio-economic factors such as age, gender and income affect the valuation of this health effect.

The results suggest that individuals who are skin sensitised have a WTP over 5 years of USD_{2023} PPP 6.7 to avoid one additional day of a skin flare-up, whereas individuals who are not skin-sensitised show a WTP over 5 years of USD_{2023} PPP 9.0 to reduce the risk of becoming skin sensitised by 10 percentage points and to avoid a day of skin flare-up. Results indicate that both severity and visibility substantially increase the value people place on avoiding skin flare-ups. Among the skin sensitised sample, the mean WTP over 5 years to avoid a severe two-week facial flare-up is estimated at USD_{2023} PPP 542 compared to USD_{2023} PPP 195 for a comparable non-visible flare-up. Among the non-skin sensitised sample, the mean value of statistical case of a severe two-week facial flare-up on the face is USD_{2023} PPP 4,441 and USD_{2023} PPP 1 912 when located on a non-visible area of the body.

1 The Valuation of Skin Sensitisation

1.1. Introduction

Skin sensitisation is a condition that affects millions at the global scale developing through allergic contact dermatitis and related dermatological reactions (Prüss-Ustün et al., 2011[3]), such as rashes skin that are itchy, visible, and sometimes painful. In turn, this can lead not only to immediate health complications but also to broader and long-term socioeconomic consequences. These include physical discomfort and treatment costs as well as workplace absences and diminished quality of life, with estimated societal costs reaching EUR_{2018} 11-16.4 billion in Europe for fragrance allergy alone (Sørensen and Christensen, 2019[4]), likely representing an underestimate of the true total cost of skin sensitisation and an estimated lifetime societal burden of USD 88.8 billion in the United States for chronic pruritus alone (Whang et al., 2021[5]).

Chemical exposure in both occupational and everyday contexts represents a significant source of skin sensitisation (Goossens and Aerts, 2022[6]; Hostýnek, Reagan and Maibach, 2019[7]; Garg, McDonagh and Gawkrodger, 2009[8]). However, authorities responsible for the management of chemical sensitisers face evidentiary challenges in the assessment of regulatory proposals, especially where these require comparisons of socio-economic benefits with regulatory costs. In particular, the empirical record of the value that the public places on avoiding chemical-induced skin sensitisation remains limited.

The existing evidence base is characterised by a focus on narrowly defined populations with diagnosed skin conditions. Moreover, studies such as European Chemicals Agency (hereafter (ECHA, 2016[9])) and Health and Safety Executive (hereafter (HSE, 2019[10])) do not systematically compare valuations between sensitised and non-sensitised populations or assess the multidimensional impacts of skin sensitisation. The limited geographical coverage of current research further restricts the generalisability of findings across different national and policy contexts.

The OECD is working to remedy the lack of estimates for major health outcomes caused by chemical exposures by implementing a coordinated set of stated preference surveys, the Surveys on Willingness to pay to Avoid negative Chemicals-related Health Effects (SWACHE) project. As described in Box 1, this unique collaboration, involving partners and experts from many countries, aims to establish internationally validated and comparable WTP values for several health outcomes associated with exposure to chemicals. The present study reports on one of the selected outcomes. WTP estimates can considerably improve assessments of chemicals management options and environmental policies in individual countries. Further, conducting substantively identical surveys in multiple countries for the same health endpoints provides opportunities to use the results to examine alternative methods for benefit transfer across countries.

Box 1. The OECD SWACHE Project

Chemicals are part of our daily life and must be soundly managed to limit risks to human health and the environment. While countries around the world are setting up legal frameworks to address these risks, the cost of policy inaction is still poorly understood. Assessment of chemicals management options and environmental policies can be considerably improved by better estimating their costs and benefits. The resourcing of national chemicals management programmes also often requires economic justification of the benefits of such investment. However, current socio-economic analyses of chemical regulations use values for morbidity impacts that are often incomplete. In most cases, these values cover only lost productivity, lost earning or cost of illness and disregard the disutility costs of pain and suffering from the illnesses (Navrud, 2018[11]).

The OECD project Surveys on Willingness to Pay to Avoid Negative Chemicals-Related Health Effects (SWACHE) brings together expertise on chemical safety and economic analysis to fill this gap. The project aims to establish internationally comparable values for the willingness-to-pay (WTP) to avoid negative health effects due to exposure to chemicals. Such values can be used to demonstrate and measure the economic benefits of minimising the impacts of chemicals on human health. Moreover, by using similar methodologies, survey design, approach to analyse survey data across many health impacts and implementing the surveys in parallel in a large number of countries, the SWACHE project offers a unique perspective that make it easier to compare the value of health impacts across health outcomes as well as across countries.

The only way to capture the full WTP to avoid illness is to conduct a stated-preference study, i.e., surveys where individuals are asked to report their WTP to reduce their risk of negative health impacts due to chemicals exposure. Contingent valuation methods and discrete choice experiments do just that, and WTP figures based on these methods have been used in assessment efforts (Alberini, 2017[12]). To derive WTP values, surveys of a large number of citizens of countries have therefore been conducted under the SWACHE project. Particularly, these stated preference surveys provide data that can shed light on the disutility in terms of symptoms and lower quality of life of a given disease or health effect, which is not captured by existing metrics such as those based on the cost of illness.

The SWACHE project thus far is organised in two rounds, each focusing on 5 health effects. The first round of health effects included asthma, infertility, IQ loss, chronic kidney disease and very low birth weight. The first round of surveys was implemented in 2022 in at least five countries. In each surveyed country, a representative sample of at least 1 200 respondents was collected. Overall, one to five of the surveys were implemented in 22 countries, totalling 46 surveys conducted. Survey responses were empirically analysed to estimate mean WTP for a given reduction in health risk for each country surveyed. The second round of surveys includes hypertension, miscarriage, skin sensitisation, underactive thyroid and non-fatal cancer, and was implemented between 2023 and 2025. Overall, in the second round, one to five surveys were implemented in 19 countries, totally 50 surveys conducted. In total, across the 2 rounds of surveys, 96 surveys were executed covering more than 110 000 respondents.

SWACHE results are presented in working papers, one for each health effect. The research described in individual working papers makes a variety of empirical contributions to health valuation in the context of chemicals exposure, although, by design, the approach was not to break new conceptual, theoretical, or econometric ground. Moreover, the comparison of the estimated WTP across health effects and across countries is being carried out in a separate summary paper, which will also provide guidance for the transfer of WTP value over time and to non-surveyed countries. The first five working papers were published in 2023.

The present study addresses these limitations by undertaking a novel, large-scale stated preference study conducted under the OECD SWACHE project. The survey was implemented between September 2024 and February 2025 across 9 countries: Canada, Denmark, Japan, the Netherlands, Poland, Spain, Switzerland, United Kingdom, and the United States, resulting in 10 944 individual responses. Using a discrete choice experiment (DCE), the study elicits individuals' valuations of avoiding flare-ups associated with skin sensitisation. By capturing heterogeneity in valuations according to sensitisation status and key condition attributes, the study provides important inputs for the cost-benefit analysis of chemicals management policies aimed at reducing risks related to skin sensitisation.

1.2. Prior research

The summary presented in this section draws on the HSE (2019[10]) and ECHA (2016[9]) reports that provide comprehensive reviews of the existing literature, and also incorporates relevant evidence from more recent contributions where available.

A number of studies have examined the impacts of skin conditions on individuals by assessing changes in health utility (or well-being), typically using quality-of-life measures. These measures rely on standardised instruments designed to capture the effects of health conditions on physical, mental, and social functioning (Romero, Vivas-Consuelo and Alvis-Guzman, 2013[13]). Two widely used instruments in this context are the Dermatology Life Quality Index (DLQI) and the EQ-5D-5L, both of which are applied to assess health-related quality of life (HRQoL) (Dobrev, Atanasov and Dimitrova, 2017[14]). Together, these instruments provide quantitative evidence of how skin conditions affect multiple dimensions of daily living, including physical symptoms, psychological well-being, and social interactions.

Hauber et al. (2011[15]) applied a stated preference approach to estimate willingness-to-pay (WTP) values among 419 individuals diagnosed with mild-to-moderate psoriasis. Participants were presented with paired hypothetical treatment profiles defined by multiple attributes, including post-treatment severity (measured by residual redness), treatment modality, residual lesion count, treatment-related discomfort, the probability of pulmonary infection, and associated costs. The results indicate that participants exhibited higher WTP values for reductions in lesion severity in more visible body areas, such as the arms and legs, compared with less visible areas, including the chest and back.

This location-based variation in valuation is further supported by the broader dermatological literature, which documents location-dependent heterogeneity in preferences and quality-of-life impacts associated with skin conditions. In one of the largest international studies of skin disease, Richard et al. (2023) find that skin disease affecting the hands has a more pronounced negative impact on multiple dimensions of daily life than facial involvement, as measured by the DLQI. For highly visible localisations, several domains of quality of life are particularly affected, including social relationships, emotional well-being, and intimate relationships. Notably, DLQI scores were significantly lower among participants with skin disease localised exclusively to the hands compared with those with facial involvement. Complementary evidence from Hang et al. (2022[16]) indicates that the concurrent presence of skin disease on both the face and hands substantially amplifies the overall deterioration in health-related quality of life.

The health economics literature has also produced extensive empirical and theoretical evidence on the economic valuation of improvements in quality of life (Jönsson, 1996[17]; Power, 1980[18]; Green, Brazier and Deverill, 2000[19]). Building on this body of work, Dobrev, Atanasov and Dimitrova (2017[14]) explicitly link HRQoL measures to WTP, focusing on the burden of psoriasis vulgaris (P5sV). In their study, individuals with PsV were asked to rank eight distinct HRQoL

domains and to state their WTP for hypothetical cures affecting each domain, including physical comfort, self-care, ability to work or volunteer, concentration, emotional health, social comfort, and sleep. The results indicate significant generational differences in WTP, with younger participants reporting higher values. In addition, substantial variation was observed across HRQoL domains, with work-related functioning eliciting the highest monetary valuations.

An alternative approach to estimating WTP values is to rely directly on monetary valuation methods. For example, ECHA (2016[9]) employed a DCE to estimate the value of selected health outcomes associated with skin sensitisation in four EU Member States (Czechia, Italy, the Netherlands and the United Kingdom), and a total sample of over 3 000 respondents. In this study, respondents were presented with hypothetical scenarios characterised by multiple attributes, including a cost component. On the basis of the resulting estimates, recommended values of statistical cases were EUR_{2012} 227 for a single episode of mild acute dermatitis and EUR_{2012} 1 055 for severe chronic dermatitis. The health states assessed in the experiment spanned a range of severities and characteristics, including:

- Physical symptoms: from mild itching and red rashes to severe swelling
- Affected area: less than 10% of body surface
- Duration: ranging from two weeks to permanent effects
- Frequency: one to two flare-ups per year
- Required treatment: from daily topical creams to week-long hospitalisation
- Impact on daily life: from minor skin discomfort to limitations on occupational activities.

The findings indicated the high relative value to people of avoiding severe, as opposed to more minor, cases. Moreover, the results of that study also demonstrated that frequency, duration, and temporal distribution of episodes may all matter in valuation.

However, more recent evidence from HSE (2019[10]) are more equivocal. Using a DCE, the study examines WTP for avoiding dermatological conditions among populations in the United Kingdom and the Netherlands, based on five key attributes: the probability of skin rash, severity, hospitalisation, frequency, and duration. In both countries, mild conditions were found to be valued at levels similar to more severe cases, including those involving hospitalisation. Reductions in the probability of skin rash significantly influenced choices and valuations among Dutch respondents, whereas this attribute had a comparatively limited effect on responses in the United Kingdom.

Where treatment options are included among the choice attributes, evidence suggests that different modalities can have markedly different effects on individuals' stated preferences. For example, Myers et al. (2023) document significant heterogeneity across patients with differing levels of disease burden. Patients with lower disease burden exhibit a strong preference for topical (localised) treatments over systemic options, such as regular medication, and display lower aversion to treatment-related discomfort.

Similarly, Feldman et al. (2024[20]), using a DCE among individuals with atopic dermatitis, examine preferences related to potential health risks associated with systemic treatment options, including cancer and cardiovascular risks. The findings indicate that patients without prior experience of systemic therapies are willing to trade off greater treatment efficacy[1] in order

[1] That is, e.g. chance of achieving meaningful itch control.

to avoid the risk of adverse events and place greater importance on these risks than patients with experience of systemic therapies.

Liu et al. (2020[21]) identify heterogeneity in valuations across different types of skin conditions. Focusing on the monetary value individuals place on quality-of-life improvements associated with cutaneous lupus erythematosus (CLE), the study finds that participants diagnosed with CLE report substantially higher WTP values for a hypothetical complete cure than patients with other skin conditions, such as acne or psoriasis.

Findrik and Morawetz (2019[22]) examine a different source of heterogeneity, namely the role of information, in a contingent valuation study of WTP for fragrance-free laundry detergent in Austria. Their findings indicate that providing participants with information on skin allergy reactions significantly increases stated WTP for fragrance-free products, highlighting the importance of information effects in shaping preferences and valuations.

1.3. Current effort SWACHE project and skin sensitisation

The existing literature indicates that skin sensitisation is prevalent within the population and has substantial socio-economic costs. However, despite a relatively extensive body of research, there remains a lack of internationally comparable WTP estimates for skin sensitisation associated with chemical exposure in general, as opposed to valuations linked to a more limited set of substances or specific products. This evidence gap motivated the identification of skin sensitisation as a priority health endpoint for valuation under the SWACHE project. The literature reviewed in the preceding section highlights three key insights that directly inform the methodological approach adopted in this study.

First, skin sensitisation is characterised by multiple, distinct attributes – including severity, visibility, duration, frequency of episodes, and impacts across different life domains – that shape how individuals value the avoidance of these conditions. This multi-attribute nature of preferences implies the need for an analytical approach capable of capturing complex trade-offs across attributes. DCEs are particularly well suited to this purpose, as they allow for the systematic elicitation of preferences across multiple dimensions simultaneously.

Second, evidence from existing studies points to substantial heterogeneity in valuations across individuals and population subgroups. The wide range of WTP estimates reported in the literature underscores considerable variation in how skin sensitisation is perceived and valued. This further supports the use of DCE-based analytical frameworks, which are explicitly designed to accommodate and quantify individual-level preference heterogeneity, as detailed in Section 4.2.

Third, relatively few WTP studies explicitly examine differences in preferences between sensitised and non-sensitised populations. To date, the literature has largely focused either on general population samples or narrowly on individuals already diagnosed with skin conditions. For sensitised individuals, prior adverse experiences may be particularly salient, potentially leading to elevated risk perceptions and higher valuations of preventive measures. Conversely, repeated exposure to symptoms may also normalise these experiences, shifting perceptions of what constitutes a baseline or status-quo health state. As a result, outcomes that may appear novel or concerning to non-sensitised individuals could be perceived as comparatively routine by sensitised individuals. This divergence in perception has important implications for risk assessment, preventive behaviour, and economic valuation, and motivates the explicit consideration of both groups within the present study.

This study therefore analyses results from DCEs which incorporate multiple skin sensitisation-related attributes - including frequency, severity and location, of flare-ups episodes. The analysis provides WTP estimates to avoid suffering from these attributes for both the skin-sensitised (hereafter sensitised) and the non-skin-sensitised (hereafter, non-sensitised) separately. It also assesses socio-demographic determinants of these WTP.

The remainder of the paper is organised as follows. Section 2 describes the survey design. Section 3 discusses the survey data and presents descriptive statistics. Section 4 outlines the empirical strategy. Section 5 presents the estimated willingness-to-pay (WTP) results. Section 6 sets out recommended values for policy applications based on illustrative cases. Section 7 concludes.

2 Survey Design

This study was designed to estimate willingness to pay (WTP) to avoid skin sensitisation, with particular emphasis on ensuring that participants fully understood the nature and consequences of the condition as described in the valuation scenarios. It builds on earlier work by ECHA (2016[9]) and HSE (2019[10]) as well as expert consultations.

2.1. General SWACHE approach to survey design

As in other SWACHE studies, the OECD convened a panel of experts to develop a common overarching approach to valuing health endpoints using stated preference methods, while allowing individual surveys to be tailored to endpoint-specific requirements. Draft survey instruments were formally circulated for review by the expert panel and by delegates from OECD member countries, and subsequently revised in light of the feedback received. As survey development progressed, instruments were further refined through focus groups and one-to-one cognitive interviews, as well as reviews by health professionals and dermatologists. In parallel, additional informal exchanges among members of the expert panel were undertaken to help ensure that the survey instruments were capable of eliciting WTP values using robust and appropriate stated preference methods. Survey accessibility was ensured through the use of non-technical language and professional translation services for non-English versions of the questionnaire.

The final questionnaire and bid levels were established following multiple rounds of revision and testing. This process included more than fifteen one-to-one cognitive interviews, a pre-pilot conducted by the research team with 400 participants in the United Kingdom—who completed an online survey based on a preliminary version of the questionnaire and responded to several open-ended debriefing questions—and pilot surveys administered by Ipsos in all target countries. The survey was tested and further refined during a pilot phase.

2.2. Health outcome definition and description

An essential element of any stated preference survey is a clear definition and explanation of the good being provided, in this case, a reduction in risk of skin sensitisation. To be useful in regulatory analysis, the survey must not only describe outcomes that are medically accurate and salient for respondents but that are also compatible with the health outcomes evaluated in human health risk assessment from epidemiologic or toxicological data (US EPA, 2014[23]).

Skin sensitisation occurs when exposure to certain chemicals triggers an allergic response in susceptible individuals, also called Allergic Contact Dermatitis (ACD). The process comprises two distinct phases (European Commision, 2024[24]):

- Sensitisation Phase: Initial exposure to an allergen inducing specialised immunological memory in the body.

- Elicitation Phase: Upon subsequent exposure to the same allergen, the body mounts a clinical allergic response based on this immunological memory.

These allergic responses may manifest in a range of skin conditions, including atopic dermatitis, contact dermatitis (both allergic and irritant forms), chloracne, hyperkeratosis and psoriasis (Prüss-Ustün et al., 2011[3]). The level of risk to individuals varies considerably depending on the specific chemical agent involved. In particular, Burg and Jongeneel (2012[25]) identify several substances commonly associated with a high risk of skin sensitisation, including nickel-containing metals, potassium dichromate, cobalt, hair dyes, and resins. Nonetheless, the toxicological mechanisms linking chemical exposure to clinical outcomes are complex. Moreover, once established, allergic sensitisation may persist indefinitely; even after prolonged avoidance of exposure, subsequent contact can trigger renewed symptoms over the course of an individual's lifetime.

Box 2. Development of SWACHE survey questionnaires and application of best practices

Each SWACHE survey questionnaire was drafted by a team of authors that includes recognised experts in the field of stated preference surveys related to health impacts as well as practitioners in the socio-economic analysis (SEA) of chemicals management options.

Each survey questionnaire was developed in several steps. First, a description of the health effect (endpoint) was drafted including information about the related quality-of-life health impact, a review of any prior stated preference studies on the same health effect and suggestions for how to characterise the endpoint in a new study. Second, various valuation scenarios were developed describing the target population, the risk reduction mechanism, the payment vehicle and the elicitation method. Third, a complete draft survey questionnaire was developed including the most appropriate valuation scenario.

A steering group of experts including internationally renowned academics, SEA practitioners, regulators and health professionals provided regular feedback throughout the process. The final working papers were reviewed by the expert group as well as by country delegations as per the OECD review process.

All SWACHE survey instruments include a harmonised introduction that contains language to minimise non-response bias and comply with ethics principles:

> *Welcome!*
>
> *This survey is part of an international initiative coordinated by the Organisation for Economic Co-operation and Development (OECD) that aims to help design better policies.*
>
> *The survey asks for your views about a proposal to reduce the risk of [health effect] due to the exposure to chemicals and chemical products.*
>
> *Please read all the information and answer the questions carefully.* ***There are no right or wrong answers to the questions asked in this survey. It is your honest opinion that matters to us.*** *The survey can be completed on a mobile device, but we recommend doing it on a larger device, such as a tablet, laptop or desktop.*
>
> *We will ask some questions related to your health, habits and attitudes. Rest assured that a "Prefer not to answer" option will be available for you to select, at your discretion.*

> *Your answers throughout this survey will be kept **confidential**. Participation in the survey is **voluntary** and you may withdraw consent at any time by writing to support. Before agreeing, please also read this information sheet [hyperlink to information sheet screen].*

The informed consent of all participants to the surveys was collected by the internet panel provider. All survey response data are anonymised and participation in the survey was voluntary. In addition, best practices in terms of safe data storage are applied. A description of the SWACHE project and the first five draft questionnaires were submitted to an institutional review board, the Inserm's Ethics Evaluation Committee (CEEI), for an external, independent ethics review[2]. The submission process included a detailed description of the research project including type of data collected, measures to protect personal data, research objectives, research hypotheses and methodology. CEEI gave a favourable opinion on the project and had no significant comments on it.

All survey questionnaires also include language to minimise non-response bias within the questionnaire. For example, the following language reduces the risk of yea-sayers:

> ***Please keep these things in mind***
>
> *In surveys such as this one, people sometimes say that they would pay for a reduction in risk even if they cannot afford it.*
>
> *Please treat the following questions as if they were a real-life situation, so that your answers are as accurate as possible.*
>
> *Don't agree to pay an amount that you cannot afford to pay or if you feel that there are more important ways to spend your money.*
>
> *When answering the next questions, please consider:*
>
> - *your personal income and savings*
> - *that the payment would reduce your spending on other things you may value.*

All surveys included harmonised debriefing questions to collect data on predictors of WTP such as income and age but also questions to control for non-response bias in empirical analysis. For instance, respondents were asked how much they agree with the following statements:

- I responded to the survey as I would have done in real life.
- The survey provided me with enough information to make informed choices.
- Did you agree or disagree with the description of [health effect] provided in this survey?

All survey questionnaires included a series of debriefing questions specific to the health effect valued in order to capture potential co-benefits or protests linked to the risk reduction mechanism. These survey specific questions are described in individual working papers.

Finally, all draft surveys questionnaires were tested in at least ten one-on-one interviews with people of various background and characteristics in an English-speaking country and in a non-English speaking country. The survey questionnaires were programmed and extensively tested. The translation into languages of target countries was verified by native speakers. Some surveys benefited from a pre-pilot to further revise the survey questionnaires.

[2] See https://www.inserm.fr/en/ethics/ethics-evaluation-committee-ceei-irb/.

Each survey questionnaire was piloted in all target countries with 50 survey responses per country. The pilots allowed for calibration of the bid levels that were presented to respondents to maximise the even distribution of responses across the four possible outcomes of the double bounded dichotomous choice.

2.3. Survey structure

2.3.1. Risk communication

The survey comprises several core sections. It begins with questions on socio-demographic characteristics, including gender, age, marital status, region of residence, educational attainment, and parental status, including the age of children where applicable. The survey also covers economic variables such as household income level, employment status, as well as coverage scheme of health expenditures.

Participants were asked whether they, their family members, or close friends had ever experienced allergic reactions involving skin symptoms such as rash, itching, redness, or blisters (e.g. eczema). Additional questions assess whether respondents were aware of the cause of these reactions, including whether they were linked to chemical exposure, as well as the severity, frequency, and location of any such reactions.

Following these questions, participants were presented with standardised information on skin sensitisation:

> *"Some chemicals may cause skin reactions upon contact, e.g., rashes on your skin that are itchy, visible, and sometimes painful. You may come across these chemicals in a number of ways, as some can be found in many commonly used products, such as clothing, soaps/shampoos, cosmetics, sunscreens, gloves, pharmaceuticals, fragrances, jewellery, etc. The process of becoming allergic to these chemicals is known as skin sensitisation."*

Participants were subsequently presented with information describing the two stages of skin sensitisation, namely the induction phase and the elicitation phase:

> *"Skin sensitisation occurs in two steps:*
>
> *(1) Step 1 (Induction phase): A contact with the chemical may cause changes to your immune system. If this happens, your skin is said to become "sensitised" to that particular chemical, or group of related chemicals. There are no consequences on the skin at this stage, and you may not even be aware that you have become sensitised. However, once your skin is sensitised to a particular chemical substance, it will remain sensitised for the rest of your life.*
>
> *2) Step 2 (Elicitation phase): Following contacts with the same type of chemicals often lead to skin conditions including itchiness, burning skin, rashes, and blisters. You may experience repeated flare-ups of the condition, depending on how often you come in contact with the chemical substances. The severity, duration, and frequency of the symptoms vary among people and between flare-ups."*

Participants who did not identify as sensitised were subsequently provided with information on the lifetime probability of becoming sensitised and completed a comprehension check to assess their understanding of the risk information.

2.3.2. Valuation questions

The survey includes a DCE, the details of which are explained in this section.

Prior to the valuation section, participants were informed about potential behavioural and preventive measures that could reduce the likelihood of flare-ups. They were then asked to assess their perceived ease of adopting these measures, based on the following information provided to them:

> *"[Measures for Prevention of flare-ups]*
>
> *Even if your skin is sensitised to a particular substance, there are things you can do to avoid flare-ups or reduce symptoms.*
>
> *You could try to avoid purchasing items with chemicals known to cause skin reactions.*
>
> *Another option is to consider taking patch tests to help you identify which specific product/chemical you are sensitised to (in case it is not obvious) and then try where possible to avoid using or purchasing those products.*
>
> *Another alternative is to buy the products you usually do and apply soothing creams whenever you get flare-ups (this would also mean some increased spending when you get the flare-ups). If you apply the creams 2-3 times a day, they would relieve the itchiness and pain to a certain extent (although the visual discomfort would remain).*
>
> *However, none of these measures can prevent your skin from becoming sensitised in the first place."*

[Avoid Purchasing some Products] [Soothing Cream] [Patch Tests]

Participants were then presented with a policy scenario describing the potential certification of products free from harmful chemicals. The scenario specified that certification would result in higher prices, while product quality would remain unchanged, and that the associated price increase would apply for a period of five years. The following information was provided to respondents:

> *"[Payment Mechanism]*
>
> *One possible way of avoiding skin sensitisation and symptom flare-ups is to avoid using the products that contain sensitising chemicals. However, given how widespread the use of chemicals is, without guidance it is practically impossible to avoid all the chemicals that could cause skin sensitisation.*

> *As an alternative, producers could be asked to certify that their products do not contain skin sensitising chemicals. Suppose that these certified products, whether clothing, fragrances, metals, cosmetics, or detergents, would be identical to the products you would normally purchase (e.g., same quality, smell, effectiveness, etc.), except for the guaranteed absence of sensitising chemicals. These products would be labelled with a distinct symbol to make identifying them when making purchases easy. Also assume that these free-of sensitising-chemicals products would always be easily available for purchase.*
>
> *Suppose that switching part or all of your consumption to the products with these labels would reduce the chances of your skin ever becoming sensitised to any chemicals. This would mean that you would have a lower chance of experiencing the various skin reactions mentioned above. However, imagine that selecting products without skin sensitising chemicals for some or all of your purchases would inevitably*

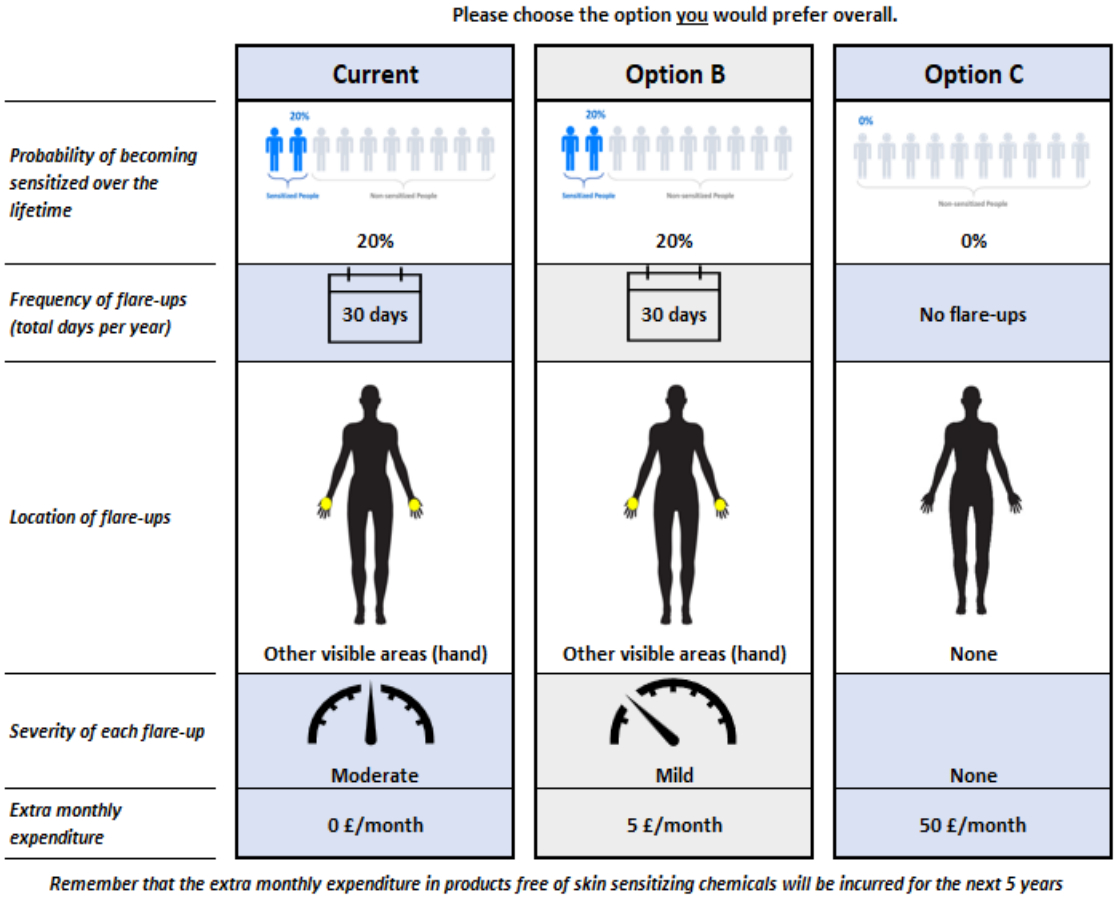
lead to an increase in your monthly spending, as these products are more expensive to produce than those that contain skin sensitising chemicals (e.g., firms would need to change production processes or at least invest in the certification). Suppose that this leads to higher prices for these products for the next 5 years, after which the prices would come down again due to research and innovation."

Participants were subsequently presented with the valuation tasks in the form of discrete choice cards. The DCE characterises the impacts of skin sensitisation using a set of distinct attributes. Four key non-cost attributes were included: (a) lifetime risk of sensitisation; (b) frequency of flare-ups; (c) location of flare-ups; and (d) severity of flare-ups. Prior to completing these tasks, respondents were shown an example choice card accompanied by an explanation of how it should be interpreted. The illustration presented in Figure 1 depicts the example shown to participants who identified as not yet having experienced skin sensitisation.

Figure 1. Example of a choice card presented to respondents

The choice card below was presented to respondents in the United Kingdom (in GBP). In each surveyed country, equivalent bid amounts were converted from US dollars into local currencies using the OECD purchasing power parity (PPP) for actual individual consumption (2021).

Below is an example of the cards that you will be shown. Each card presents a choice between three different options. Assume the first option represents the Current Situation, and then there are two alternative options (B and C) that can be achieved by purchasing products free of skin sensitising chemicals. Each option is described by a series of attributes (frequency of flare-ups, location of flare-ups, severity of each flare-up and extra monthly household expenditure in products free of skin sensitising chemicals).



*Suppose that in the **Current Situation**, you would have on average 1 flare-up per year, in other visible areas, of severe severity. Please take a moment to imagine what this would mean to you.*

*In **Option B**, if you pay an extra £5 per month for products free of sensitising chemicals, imagine that you would still have 1 flare-up every year, in less visible parts of the body, and it would be mild. Please take a moment to imagine what this would mean to you.*

*In **Option C**, if you pay an extra £50 per month for products free of sensitising chemicals, you would eliminate the chance of having any flare-ups. Please take a moment to imagine what this would mean to you.*

Considering that the payments need to be made for the next 5 years, which of the three options would you prefer? Keeping the current situation with no extra payments, or paying extra in your monthly spending for Option B or Option C?"

In addition, the survey design was tailored according to respondents' self-reported sensitisation status, building on earlier work by HSE (2019[10]). Respondents who identified as not sensitised were presented with choice scenarios that included an additional attribute describing the lifetime risk of becoming sensitised, whereas this attribute was omitted for respondents who identified as already sensitised. This differentiated design aligned the DCE with respondents' lived experience and information sets, thereby improving the extent to which the estimated preferences reflect underlying utility and behaviour (Clark et al., 2014[26]).

To support participants' understanding of probabilistic risk concepts, the survey incorporated an interactive tutorial based on dice-based probability examples. This was complemented by visual aids – consistent with those used in (Dussaux et al., 2023[27]) and other SWACHE studies – and by comprehension questions designed to reinforce understanding. Drawing on extensive pilot testing and consultations with dermatologists, the lifetime risk levels for developing skin sensitisation were specified at 10%, 20%, and 30%.

All participants were then presented with information describing the frequency of flare-ups, the location of occurrence, and the severity of associated symptoms. The choice cards varied attribute levels in order to enable estimation of WTP values for each attribute. In defining the frequency of flare-ups attribute, the study sought to balance realism with comprehensive coverage of the preference space. In contrast to earlier studies such as HSE (2019[10]) and ECHA (2016[9]), which focused on relatively low frequencies, the present study adopted a broader range to capture variation across more frequent symptom occurrences. Respondents were therefore asked to evaluate scenarios featuring 5, 15, 30, 50, or 75 days with flare-ups per year. The selection of flare-up locations was informed by several strands of the existing literature. Previous valuation studies indicate that individuals' preferences vary by the location of skin reactions, with higher willingness to pay associated with effects on more visible areas (Hauber et al., 2011[15]). This pattern is consistent with broader evidence linking visible skin conditions to adverse psychological outcomes, including depression, anxiety, and reduced self-esteem (Germain et al., 2021[28]). Importantly, the literature also suggests heterogeneity even among visible areas. For example, Richard et al. (2023[29]) report greater quality-of-life impairment for hand-related skin disease relative to facial involvement, while Hang et al. (2022[16]) find that, although both facial and hand manifestations reduce quality of life, facial involvement alone may have more severe impacts than exclusive hand involvement. On the basis of these findings, flare-up location was categorised into three groups: the face, other visible areas, and less visible areas. Finally, symptom severity was specified to reflect the intensity of flare-ups across three levels: mild, moderate, and severe manifestations. Table 1 provides a summary of DCE attributes.

Table 1. Attributes and levels for discrete choice experiment in this study

Attribute	Levels
Probability of becoming sensitised (for the non-sensitised sample)	None
	10%
	20%
	30%
Number of days with flareups	None
	5 / year
	15 / year
	30 / year
	50 / year
	75 / year
Location of flareups	None
	Less visible areas
	Other visible areas (hand)
	Face
Severity of each flareup	None
	Mild
	Moderate
	Severe
Extra monthly household spending (translated into local currencies via PPP conversion)	None
	USD 1 per month
	USD 5 per month
	USD 10 per month
	USD 25 per month
	USD 50 per month

Each participant was presented with six choice tasks, drawn at random with equal probability from a total of forty choice cards. Choice cards were assigned randomly and without replacement, ensuring that no participant was presented with the same set of options more than once. Each choice card presented three alternatives: a status quo option, involving no change in outcomes and no additional cost, and two improvement alternatives (Options B and C). Option C was consistently specified as offering the greatest health improvement—corresponding to the most favourable outcome (i.e. no flare-ups)—and was associated with the

highest cost among the three alternatives. In line with best practices in experimental design, the choice cards were finalised using an efficient design approach, implemented with the NGENE software to minimise the standard errors of the estimated parameters. Following Ferrini and Scarpa (2007), the initial design was specified as orthogonal, reflecting the absence of prior parameter estimates at the outset.

The bids presented to the respondents were converted from US dollars into local currency using the OECD PPP for actual individual consumption adjustment for 2021. These values were then rounded to a whole number with two significant figures to produce a value that was easy to understand by the local respondent. Because of this rounding, each country's bid values for the econometric analysis do not fall into discrete bins. Instead, bid values are a continuous variable.

During the pilot phase, several important revisions were introduced. In particular, the attributes relating to flare-ups was modified from the number of flare-ups per year to the number of days with flare-ups per year, in order to increase salience for respondents. In addition, two further levels were added to the cost attribute. The design for the main fieldwork phase was also updated to incorporate priors derived from the pilot results, thereby improving statistical efficiency for the full experiment.

2.3.3. Debriefing remarks

Following completion of the choice tasks, participants were asked a series of debriefing questions designed to further explore the reasons underlying their choices, as well as the relative importance they attached to the attributes and descriptions characterising the choice scenarios. The purpose of these questions was to better understand the key drivers of WTP and to assess whether participants' responses reflected the intended changes in skin sensitisation outcomes. In particular, respondents were asked about the difficulty they faced in answering questions, whether they answered while focusing on their own situation rather than one of their relatives', the choice attributes which most impacted their choices, and reasons why respondents never chose a more expensive option than their status quo – where relevant.

The survey followed with two sections on risk and health perception inquiry. For example, respondents were asked their degree of exposure to chemicals, their perceived risk of skin sensitisation compared to others, their perceived general health status and whether they have been diagnosed with a chronic disease, their perceived safety levels of their usual home products and their purchasing behaviour regarding chemical safety.

The concluding sections of the survey included a set of attitudinal questions. Some of these were common to SWACHE studies more generally, such as questions relating to health perceptions, while others were specific to the focus of the present study on skin sensitisation. These final sections also incorporated additional socio-economic questions that had not been covered earlier in the survey, most notably those relating to household income.

3 Survey Data

3.1. Survey implementation and screening strategy

The study was implemented by Ipsos European Public Affairs across nine countries: Canada, Denmark, Japan, the Netherlands, Poland, Spain, Switzerland, the United Kingdom, and the United States. Pilot testing was conducted between January 2024 and January 2025, and final surveys were fielded between September 2024 and February 2025. Box 3 describes the survey implementation and screening strategy common to all SWACHE project surveys.

Box 3. Quality of the internet panels used in SWACHE

The field implementation of the SWACHE surveys was carried out in all surveyed countries by Ipsos European Public Affairs, selected after a careful call for tender process. Ipsos has significant experience in multi-country projects and maintains panels of respondents in many countries. Fieldwork, pilot and main stage, took place between July 2023 and February 2025 for the second round of surveys. The surveys were conducted via Computer-Assisted Web Interviewing (CAWI). Random samples of at least 1 200 respondents matching the target population were drawn for each country from a high-quality network of online access (non-probability) panels. Some surveys had specific requirements regarding the target population due to the endpoint under consideration. This is elaborated in survey-specific information.

Online panels are databases of potential participants who declare that they will cooperate for future data collection if selected, generally in exchange for a reward or incentive. Loyalty card and subscription databases are included here if there is a continuous relationship with members who understand the commitment asked of them. Ipsos has its own supply of sample through its globally managed i-Say (IIS) panels and some locally owned Ipsos panels. In addition, Ipsos partners with many different types of external suppliers to source sample when needed to fulfil project requirements. This includes other traditional research panels, reward or loyalty communities, intercept or offer wall providers, and sample exchanges. Ipsos can also leverage its Direct-to-Survey channel which accesses respondents directly through social media platforms. To reach respondents, Ipsos has a proprietary project management and workflow system that controls access to their panel assets and where necessary, external respondent sources.

Importantly, Ipsos implements procedures to make sure that respondents to surveys are real, unique, engaged and fresh. To ensure that their respondents are real, i.e. they are who they claim to be, Ipsos uses country geo-IP validation and digital fingerprinting to check if the respondent used a device that is truly located or if it is evading detection and also if the respondent's device has any past history of fraud. These tools used in combination with cookies can make sure that each respondent is unique and has not already accessed the survey. To guarantee respondents are engaged, their survey taking behaviour

is evaluated in real time, through standard self-adjusting algorithms involving speeding and straight-lining detection (i.e., always choosing the first (or nth) answer in multiple choice). The worst offenders are automatically removed from the data deliverables and are not counted against quotas. Finally, Ipsos invited members of their panels that were fresh, i.e., that have not taken part in any of the other SWACHE surveys and were not overburdened with surveys in general.

After the main stage was completed, the online survey data were evaluated by Ipsos using several quality markers that feed into an overall quality score for each respondent: survey length and speeding, straight lining and proportion of "don't know" answers.

The survey was open to adults aged 18 and over. Participant selection was based on quota sampling across key demographic characteristics (gender, age group, level of education, and geographic region) to ensure broad representativeness of national populations. Screening of survey responses followed a set of core principles for empirical analysis agreed by the SWACHE research team. In line with established best practice, respondents who completed the survey in less than 48% of the national median completion time were classified as "speeders" and excluded from the analytical sample, consistent with guidance provided by (Survey Sampling International, 2013[30]) and Mitchell (2014[31]). Exclusions also covered incomplete questionnaires and those displaying implausible response patterns in attitudinal questions (e.g. "straight-lining") or providing an excessive number of "don't know" responses.

In total, 10 944 high-quality interviews were retained for analysis, corresponding to approximately 1 200 respondents per country. The distribution of participants across countries is presented in Table 2, while Annex C reports the regional distribution within each country.

Table 2. Participants distribution by country

Country	N
Canada	1 220
Denmark	1 215
Japan	1 215
Netherlands	1 217
Poland	1 217
Spain	1 220
Switzerland	1 204
United Kingdom	1 218
United States	1 218
Total	**10 944**

3.2. Demographics and representativeness of the achieved samples

This section presents descriptive statistics for the full analytical sample of 10 944 respondents drawn from the 9 study countries. These summary statistics are reported prior to the application of sample weights. The unweighted data indicate some variation across countries in key demographic characteristics, including gender, age, educational attainment, marital status, and area of residence.

Table 3. Demographic characteristics by country: target and achieved samples

Category	Canada		Denmark		Japan		Netherlands		Poland		Spain		Switzerland		United Kingdom		United States	
GENDER																		
	T	A	T	A	T	A	T	A	T	A	T	A	T	A	T	A	T	A
Female	50	50.6	50	47.7	51	49.3	50	49.0	52	50.2	51	50.6	50	51.8	51	52.5	50	54.9
Male	50	48.9	50	52.1	49	50.2	50	50.8	48	49.8	49	48.7	50	48.0	49	46.8	50	43.8
Other		0.2		0.2		0.1		0.1		0.0		0.4		0.0		0.2		0.4
Prefer not to answer		0.3		0.0		0.4		0.2		0.0		0.3		0.2		0.5		0.9
AGE GROUP																		
18-29	19	17.2	19	21.0	12	10.4	19	16.7	15	15.9	15	15.2	17	18.1	19	19.3	20	20.0
30-44	25	26.2	22	23.6	21	20.8	23	23.7	28	29.5	24	24.0	26	28.1	25	21.8	25	23.9
45-59	26	24.2	27	23.4	27	28.3	25	25.7	24	25.1	30	30.0	26	27.7	27	27.4	25	26.0
60+	31	32.4	31	32.0	40	40.5	33	33.9	32	29.5	30	30.7	31	26.1	29	31.5	29	30.0
MARITAL STATUS																		
Have partner, not married		21.8		24.1		6.7		24.9		24.2		22.5		23.2		20.1		14.6
Married		49.1		39.9		57.0		46.6		49.6		50.6		41.3		54.5		51.9
Not in a relation-ship		26.9		34.6		35.7		27.4		24.1		24.4		33.1		23.3		30.6
Other		2.2		1.4		0.5		1.2		2.1		2.5		2.4		2.1		2.9
INCOME BAND																		
Low income (1-3)		41.7		34.4		27.5		28.1		40.1		34.2		37.8		31.8		43.9
Middle income (4-6)		28.7		29.6		33.4		39.3		16.9		41.3		25.0		28.1		26.8
High income (7-end)		29.6		36.0		39.1		32.6		43.0		24.5		37.2		40.1		29.3
EMPLOYED																		
No		41.4		45.2		34.8		40.9		37.6		39.9		33.0		38.7		43.4
Yes		58.6		54.8		65.2		59.1		62.4		60.1		67.0		61.3		56.6
NUMBER OF <18 CHILDREN																		
0		75.2		69.1		83.7		77.9		64.7		66.9		70.6		68.6		67.0
1		13.7		15.5		9.1		11.3		20.6		21.6		14.1		15.5		16.5
2		8.4		11.8		5.5		8.6		11.0		10.2		10.9		12.8		12.2
3		2.3		2.9		1.5		1.8		2.5		1.1		3.1		2.3		3.4
4		0.2		0.7		0.2		0.4		0.9		0.1		0.9		0.5		0.7
5		0.1	0	0.0		0.0		0.0		0.1		0.0		0.2		0.3		0.1
6		0.1	0	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.2
7		0.0	1	0.1		0.0		0.0		0.1		0.0		0.2		0.0		0.0
EDUCATION																		

Low/Med	38	40	48	56	69	65	57	57	67	67	59	57	55	55	50	50	50	42
High	62	60	42	44	31	35	43	57	33	33	41	43	45	45	50	50	50	48

Note: All figures are presented as percentages (%). "T" refers to the Target Sample and "A" to the Achieved Sample. An empty cell in column "T" indicates that no value was defined for the target sample. Percentages may not sum to 100% as a result of rounding. Income band distributions may not include all respondents due to missing responses.

The final sample was well balanced across the 9 study countries, with each country contributing approximately 11.1% of the total number of respondents. Gender distributions were broadly comparable across countries, with the share of female respondents ranging from 47.7% in Denmark to 54.9% in the United States. Mean age was also relatively consistent, varying between 46.6 years in Poland and 50.0 years in the Netherlands.

Age groups were generally well represented, with individuals aged 60 years and over constituting the largest group in most countries (26.1%–33.9%), followed by those aged 30–44 and 45–59. Younger adults aged 18–29 were somewhat under-represented in comparison. In line with national demographic patterns, married respondents represented the largest marital-status group in most countries (39.9%–51.9%), followed by respondents not in a relationship (24.1%–34.6%) and with a non-married partner (14.6%–24.9%) and those.

Employment rates varied across countries, ranging from 54.8% in Denmark to 67.0% in Switzerland, with most countries exhibiting employment levels between 56% and 62%.

Income distributions exhibited notable variation across countries. The Netherlands recorded the lowest share of respondents in the low-income category (28.1%), Poland the highest proportion of high-income respondents (43.0%), and Spain the largest share of middle-income respondents (41.3%). Overall, high-income respondents appear over-represented across all countries.

To address differences between achieved and target quotas, a post-stratification weighting procedure was applied to align the survey sample with selected population benchmarks. These post-stratification weights are used in the empirical analysis presented in Section 5.1, ensuring that the estimated mean and median WTP values are representative of the populations in the sampled countries.

The underlying rationale for this approach is that aligning the sample with known population distributions for key characteristics is expected to improve the accuracy of other survey variables that may be affected by non-response or coverage bias. In each country, the post-stratification weights were based on the following socio-demographic variables and category levels:

- Gender: (1) male; (2) female
- Age: (1) 18–29 years; (2) 30–44 years; (3) 45–59 years; (4) 60 years and over
- Educational attainment: (1) low or medium; (2) high

Weights were computed using an iterative proportional fitting (raking) algorithm based on contingency table analysis. To avoid excessive influence of any single observation, weights exceeding 3.0 were capped at 3.0 at the conclusion of each iteration. This trimming procedure limits extreme weights and helps maintain the robustness and stability of the weighted estimates.

3.3. Summary statistics

This section presents summary statistics on the main questions on respondents' experience of skin sensitisation, attitudes towards product safety and chemical exposure and debriefing questions. Annex B details further summary statistics on other health conditions, perceived risk, and choice determinants by country.

3.3.1. Experiencing skin sensitisation

Skin sensitisation was reported as prevalent across the study population, with 62.5% of respondents indicating that they had at some point experienced an allergic reaction accompanied by skin symptoms such as rash, itching, redness, or blisters. Table 4 to Table 7 present these results separately for respondents' own experiences and medical diagnosis and for reported experiences and medical diagnosis of friends and family members.

The share of reported sensitisation was lower for friends and family members than for respondents' own experiences, which may reflect more limited awareness of others' medical histories. These findings are based on self-reported information and should therefore be interpreted with appropriate caution. Among respondents reporting personal experience of skin reactions, 45.8% indicated that the condition had been confirmed by a medical professional (Table 5). Similarly, 41.7% of respondents reporting reactions among friends or family members indicated that these cases had received a doctor's diagnosis (Table 7).

For the purposes of the discrete choice experiment, only respondents reporting a doctor-confirmed diagnosis were classified as sensitised and assigned to the sensitised scenario. All remaining respondents were assigned to the non-sensitised scenario.

Table 4. Reported own experience of skin sensitisation

Percentage of respondents

	Yes (%)	No (%)	I don't know (%)	I prefer not to answer (%)	Number of observations
Canada	64.0	31.7	4.3	0	1 220
Denmark	66.7	28.8	4.2	0.3	1 215
Japan	61.9	34.4	3.2	0.4	1 215
Netherlands	64.2	31.5	4.1	0.2	1 217
Poland	66.5	26.3	6.9	0.3	1 217
Spain	62.6	31.7	5.3	0.4	1 220
Switzerland	62.0	33.6	4.3	0.1	1 204
United Kingdom	58.5	38.4	3.0	0.2	1 218
United States	55.8	40.9	3.2	0.1	1 218
Total	62.5	33.0	4.3	0.2	10 944

Note: Answer to the question "Have you ever experienced an allergic reaction accompanied by skin reactions such as rash, itching, redness, or blisters, (e.g., eczema)". Percentages are calculated within each country.

Table 5. Diagnosed with skin sensitisation by a doctor

Percentage of respondents among those reporting experience with skin sensitisation

	Yes (%)	No (%)	I don't know (%)	I prefer not to say (%)	Number of observations
Canada	44.6	48.9	6.0	0.5	781
Denmark	46.7	45.5	7.0	0.9	811
Japan	46.6	42.3	11.1	0	753
Netherlands	50.6	39.4	9.2	0.8	781
Poland	37.6	52.9	8.4	1.1	809
Spain	51.3	39.8	8.5	0.4	764
Switzerland	46.3	42.8	10.7	0.1	747
United Kingdom	42.5	51.3	5.6	0.6	712
United States	46.6	45.6	7.0	0.8	680
Total	45.8	45.4	8.2	0.6	6 837

Note: Answer to the question: "Was this allergic reaction ever diagnosed by a doctor?". Percentages are calculated within each country.

Table 6. Family and friends' experience of skin sensitisation

Percentage of respondents reporting having relatives who have experienced skin sensitisation

	Yes (%)	No (%)	I don't know (%)	I prefer not to say (%)	Number of observations
Canada	31.4	52.2	16.2	0.2	439
Denmark	33.7	47.7	18.0	0.6	404
Japan	13.2	72.9	12.9	1.0	462
Netherlands	30.7	57.7	10.7	0.9	436
Poland	27.5	48.0	24.0	0.5	408
Spain	32.4	53.6	12.2	1.8	456
Switzerland	33.1	53.9	12.9	0.2	457
United Kingdom	28.4	63.6	7.8	0.2	506
United States	24.8	61.8	13.2	0.2	538
Total	28.2	57.3	13.9	0.6	4 107

Note: Answer to the question: "Has any one of your family members or close friends ever experienced an allergic reaction accompanied by skin reactions such as rash, itching, redness, or blisters, (e.g., eczema)?". Percentages are calculated within each country.

Table 7. Family and friends' diagnosis of skin sensitisation by a doctor

Percentage of respondents reporting on relatives who have experienced skin sensitisation

	Yes (%)	No (%)	I don't know (%)	I prefer not to say (%)	Number of observations
Canada	38.5	34.5	27.0	0	138
Denmark	50.2	23.3	25.6	0.9	136
Japan	50.5	29.6	19.9	0	61
Netherlands	47.4	34.6	17.3	0.7	134
Poland	33.4	31.5	34.2	0.8	112
Spain	24.7	54.5	20.8	0	148
Switzerland	45.0	19.9	33.7	1.4	151
United Kingdom	47.1	32.9	19.2	0.7	144
United States	43.3	34.0	22.7	0	134
Total	41.7	33.0	24.7	0.5	1 157

Note: Answer to the question: "Was their allergic reaction ever diagnosed by a doctor?". Percentages are calculated within each country.

This prevalence for own experience (Table 4) varied by country, with Poland showing the highest rate (66.5%) and the United States the lowest (55.8%). Importantly, the survey first asked participants to state whether they perceived to be sensitised based on reactions they sustained after being in contact with chemicals and then asked whether they received a diagnosis for their skin reaction. With regards to the latter, for example, 28.6% of participants overall stated they had received a formal diagnosis, ranging from 24.8% in Poland to 32.5% in the Netherlands.

Although many respondents in this sample report skin sensitisation, it is difficult to find an overall prevalence benchmark because most research focuses on specific rather than all allergens. A few studies report cross-allergens metrics. For example, Olusegun and Martincigh (2021[32]) estimate that approximately 20% of the European population has a contact allergy (as an effect of skin sensitisation) to at least one allergen. Diepgen et al. (2016[33]) found an average prevalence of contact allergy of 27% across Sweden, the Netherlands, Germany, Italy and Portugal. Thyssen et al. (2007[34]) conducted a worldwide meta-analysis and concluded that the median prevalence of contact allergy to at least 1 allergen was 21.2%, with a range of 12.5-40.6%. In their meta-analysis, Aligaghi et al. (Alinaghi et al., 2019[35]) find a similar prevalence of 20.1%. Therefore, in the current study, the DCE for the skin-sensitised group is based on cases with a reported diagnosis by a medical doctor, rather than on self-reported sensitisation.

This finding from the literature highlights an important characteristic of existing studies in this field. Dermatological research often focuses on reactions to specific chemicals within particular national contexts, resulting in reviews whose findings are highly context-dependent (e.g. (Reeder et al., 2023[36]; Tsui et al., 2022[37]; Goossens and Aerts, 2022[6]; Hostýnek, Reagan and Maibach, 2019[7]). Moreover, studies rarely report correlations between sensitisation to different chemicals—for example, whether individuals sensitised to nickel are more or less likely to be sensitised to formaldehyde. In the absence of such information, it is not possible to infer the probability that an average individual is sensitised to at least one chemical without making strong assumptions. Simple aggregation across substances, for instance by summing sensitisation rates, would likely result in an overestimation of population-level prevalence.

In addition, some individuals experiencing skin reactions may not seek a formal diagnosis, either due to limited time or access to medical services, or because they do not perceive a diagnosis to be of sufficient practical value. Whether the figures reported in Table 4 therefore imply an overestimation of the prevalence of skin sensitisation in the general population relative to other studies cannot be determined conclusively. Nevertheless, there is strong evidence that sensitisation rates are increasing for a number of chemicals (Beutner et al., 2021[38]; Reeder et al., 2023[36]).

Tables A5 and A6 in the Annex provide additional context by describing the characteristics and severity of sensitisation experiences, which vary noticeably across the study population. The Annex also reports general health indicators and comorbidities, offering further insight into sensitisation within the sample.

3.3.2. Attitudes towards product safety and chemical exposure

Table 8, Table 9 and Table 10 summarise respondents' attitudes towards product safety and chemical exposure. Overall, the results indicate a high level of concern across the sample population. Nearly three-quarters of respondents (72.8%) reported that "chemical-free" products are relevant to their purchasing decisions, with 42.1% considering them "somewhat relevant" and a further 30.4% rating them as "very relevant". These concerns are reflected in reported purchasing behaviour. Just over half of respondents (51.8%) indicated that they seek

to purchase safer products when this does not involve additional cost, while more than one quarter (27.1%) reported a willingness to pay a price premium for products perceived to be safer.

Despite these concerns, the majority of respondents (62.3%) considered the products they currently use to be "reasonably safe for people's health," while only a small minority (15.0%) reported that they do not pay attention to product safety. This apparent discrepancy points to a complex relationship between risk perceptions, safety concerns, and consumer behaviour. In particular, self-reported experience of skin sensitisation does not necessarily translate into heightened concern regarding products currently in use. Instead, it may reflect a distinction between general awareness of skin sensitivity risks and confidence in personal product choices.

Table 8. Relevance of chemical-free products by country

Answer to the question: "How relevant do you think buying products without skin sensitising chemicals is for reducing skin sensitisation?". Percentages of respondents calculated within each country.

Relevance	Canada	Denmark	Japan	Netherlands	Poland	Spain	Switzerland	United Kingdom	United States	Total
	%	%	%	%	%	%	%	%	%	%
I don't know	7.6	9.7	14.0	6.7	17.4	7.1	6.4	8.9	7.6	9.5
Not at all relevant	3.4	5.0	1.2	7.2	5.6	2.9	4.2	3.0	4.0	4.1
Not very relevant	11.9	19.1	6.0	21.1	11.8	12.5	14.9	10.5	12.1	13.3
Somewhat relevant	44.4	41.8	45.7	43.9	33.4	42.4	45.8	43.0	41.7	42.5
Very relevant	32.7	24.4	33.1	21.0	31.7	35.2	28.7	34.5	34.6	30.7

Table 9. Safety perception of products used by country

Answers to the question: "Take a moment to think about the products you typically purchase. How do you feel about them?". Percentages of respondents are calculated within each country.

Safety	Canada	Denmark	Japan	Netherlands	Poland	Spain	Switzerland	United Kingdom	United States	Total
	%	%	%	%	%	%	%	%	%	%
I don't know	10.7	15.8	15.6	11.4	15.9	10.9	11.5	9.3	8.9	12.2
Reasonably safe for people's health	67.4	58.2	63.7	62.4	59.6	59.6	62.0	62.1	65.5	62.3
Reasonably unsafe for people's health	5.6	8.6	7.4	4.7	6.4	5.8	10.5	2.8	5.3	6.4
Totally safe for people's health	15.0	16.5	11.9	21.0	16.4	23.1	14.6	25.7	19.3	18.2
Totally unsafe for people's health	1.3	0.8	1.4	0.4	1.6	0.6	1.3	0.2	0.9	1.0

Table 10. Attitude towards buying safer products by country

Answers to the question: "Which of the following statements best describes your purchasing behaviour?". Percentages of respondents are calculated within each country.

Tries to buy safer products	Canada	Denmark	Japan	Netherlands	Poland	Spain	Switzerland	United Kingdom	United States	Total
	%	%	%	%	%	%	%	%	%	%
I do not pay much attention to the products' effect on my health	13.8	16.9	18.4	19.6	11.8	8.9	13.0	18.1	14.4	15.0
I try to buy safer products even if it comes at an extra cost	26.2	28.5	12.8	29.0	25.1	30.9	30.5	27.8	33.1	27.1
I try to buy safer products if it doesn't come at an extra cost	54.8	47.6	58.9	45.3	56.2	54.4	51.9	49.2	47.9	51.8
I don't know	5.2	7.1	9.9	6.1	6.9	5.8	4.6	4.9	4.7	6.1
Total	1.3	0.8	1.4	0.4	1.6	0.6	13.0	0.2	0.9	1.0

3.3.3. Debriefing questions

After the valuation questions, respondents were asked debriefing questions to assess their level of concentration and honesty when taking the survey. Participants across all nine countries reported high levels of engagement with the survey materials and methodology, providing largely positive feedback on several aspects of the study design (Table 11).

Table 11. Consequentiality perceived by country

Variable	All		Canada		Denmark		Japan		Netherlands		Poland		Spain		Switzerland		United Kingdom		United States	
	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd
Behaved as in real life	4.15	0.88	4.32	0.1	4.06	0.82	3.65	0.87	4.23	0.86	4.11	0.88	4.23	0.91	4.08	0.86	4.36	0.80	4.34	0.87
Had enough info to decide	3.99	0.88	4.10	0.86	3.83	0.87	3.74	0.80	3.98	0.87	3.90	0.87	4.06	0.91	3.88	0.88	4.24	0.83	4.22	0.88
Had accurate info to decide	3.96	0.87	4.10	0.86	3.83	0.84	3.67	0.78	4.00	0.87	3.93	0.88	4.02	0.93	3.89	0.85	4.12	0.81	4.10	0.91
Feels confident in info provided	3.86	0.86	4.07	0.81	3.75	0.91	3.48	0.78	3.85	0.87	3.85	0.83	3.77	0.78	3.64	0.89	4.18	0.77	4.12	0.87
Previous knowledge level	2.76	0.96	2.84	0.97	2.75	0.97	2.15	0.79	2.58	0.89	2.84	0.85	2.87	0.97	2.78	0.93	2.90	0.97	3.10	0.99
Post-survey knowledge level	3.49	0.85	3.72	0.75	3.48	0.78	2.64	0.75	3.33	0.74	3.40	0.78	3.45	0.80	3.45	0.80	3.80	0.77	3.94	0.76

Note: All variables are measured on a 5-point scale where higher values indicate stronger agreement or higher levels. The first three answers correspond to the question: “How much do you agree or disagree with the following statements?”. The fourth answer corresponds to the question: “How confident are you that the information that has been provided in this survey is correct?”. The fifth answer corresponds to the question: “How would you describe your knowledge of skin sensitisation before having taken this survey?”. The sixth answer corresponds to the question: “How would you describe your knowledge of skin sensitisation after having taken this survey?”.

On a 5-point scale, participants indicated they behaved as they would in real-life situations during the survey (average 4.22), with the highest scores reported in the United Kingdom (4.36) and the United States (4.34), and the lowest in Denmark (4.06). Similarly high ratings were given regarding the sufficiency of information provided for making choices (average 4.03), with participants from the United Kingdom again reporting the highest satisfaction (4.24) and those from Denmark the lowest (3.83). The perceived accuracy of information showed a parallel pattern (average 4.00), with the highest ratings in the United Kingdom (4.12) and lowest in Denmark (3.83), suggesting consistently higher critical evaluation of survey materials among Danish participants compared to other countries.

Also based on a 5-point scale, confidence in the provided information varied somewhat more across countries (average 3.91), with participants from the United Kingdom expressing the highest confidence (4.18) and those from Switzerland the lowest (3.64). This variation may reflect different cultural attitudes toward scientific information or different expectations regarding health information across the study countries. The participants' self-reported knowledge about skin sensitisation prior to the survey was moderate (average 2.83), with the United States reporting the highest prior knowledge (3.10) and the Netherlands the lowest (2.58). Importantly, participants reported substantial knowledge gains through participation in the study (average 3.59), with the United States showing the greatest self-reported learning (3.94) and the Netherlands the least (3.33), though still positive. This indicates that the survey successfully served an educational function while collecting data, potentially increasing public awareness about skin sensitisation issues. The consistently positive evaluations across multiple dimensions suggest the survey methodology was robust and accessible to participants across different national and cultural contexts.

4 Empirical Strategy

This study primarily employs a discrete choice experiment (DCE) to assess the benefits of reducing chemical exposure that leads to skin sensitisation. The DCE approach is particularly well suited to this context, given the multidimensional nature of skin sensitisation, which involves trade-offs across multiple attributes, including risk levels, affected body areas, and variations in the frequency and severity of symptoms. A key strength of the method lies in its ability to disentangle these interrelated health attributes, thereby enabling more precise measurement of individuals' preferences.

Moreover, the DCE framework aligns closely with a risk-based approach to chemicals management. By requiring respondents to evaluate trade-offs between health outcomes and associated costs, the method mirrors the types of decisions faced by policymakers when assessing regulatory options for reducing chemical risks.

Box 4. Consistent analysis of survey responses across SWACHE health effects

Each focused on a single health effect, the SWACHE working papers will ultimately feed into an OECD summary paper that will gather the recommended estimates for WTP values and Value of Statistical Case (VSC) for all endpoints, compare them across countries and offer comprehensive guidance for practical use by practitioners including guidance on benefit transfer that is the transfer of value over time and toward non-surveyed countries. Consequently, the different teams involved in the SWACHE project adopted a similar core strategy on how datasets would be cleaned and analysed empirically to allow the proper comparison of WTP values across countries and endpoints. A series of consensus meetings with the teams of survey authors led to the adoption of a set of Core Principles of Survey Analysis that are applied but adapted, when necessary, to survey specificities and data. As indicated in Box 1, the idea is not to break new conceptual, theoretical or econometric ground but to set up core principles that are consistent with the economic valuation literature and are widely recognised in the field. These shared principles ensure that all the working papers apply the same empirical strategy in terms of data cleaning, screening of respondents, specification, estimators, robustness checks and guidance on which central WTP or VSC value should be used in regulatory impact analysis. The final version of these Core Principles of Survey Analysis is presented in Annex A.

4.1. Discrete choice experiment design

In total, 40 choice cards were generated, with each respondent completing six cards selected at random. Each choice card presented three unlabelled alternatives: a status quo option, involving no change in outcomes and no additional cost, and two improvement options (Options B and C). Option C was consistently specified as providing the greatest health improvement—corresponding to the elimination of flare-ups—and was associated with a higher cost relative to Option B. Alternatives were unlabelled to ensure that respondents' choices reflected trade-offs across attributes and associated willingness-to-pay (WTP) values, rather than preferences for labelled options (Bekker-Grob et al., 2010[39]).

Two versions of the experimental design were implemented. For respondents classified as sensitised – i.e. who reported having a diagnosis by a medical doctor, the attribute capturing the lifetime probability of skin sensitisation ("Prob") was excluded. For all the other respondents, which were classified as non-sensitised, this attribute was included. This dual-design approach ensured that choice tasks were appropriately tailored to respondents' sensitisation status while maintaining a consistent analytical framework across samples.

4.2. Model Specifications

The analysis is grounded in the Random Utility Model (RUM) framework (McFadden, 1974[40]). The utility that individual n derives from alternative j in choice situation t is specified as:

$$U_{njt} = x'_{njt}\beta + \varepsilon \quad (1)$$

Where $x'_{njt}\beta$ is the deterministic component of the utility function consisting of a matrix of attributes and preference-related coefficients to be estimated, and ε is a stochastic error term capturing unobserved influences on choice. The deterministic component may also include alternative-specific effects for the $j-1$ non-reference alternatives.

When the error terms are assumed to be independently and identically distributed (i.i.d.) according to a Type-I extreme value (Gumbel) distribution, the model reduces to the multinomial logit (MNL) specification. Under this formulation, preferences for attributes are assumed to be homogeneous across individuals. This distributional assumption is standard in discrete choice modelling, as it leads to a closed-form expression for choice probabilities with convenient analytical properties. In addition, the i.i.d. assumption implies that unobserved components of utility are uncorrelated across alternatives and have equal variance (Train, 2009).

To relax the assumption of preference homogeneity, the analysis allows for heterogeneity in tastes by estimating individual-specific preference parameters rather than a single coefficient β per attribute or attribute level. Model estimation was carried out using the *Apollo* package in R.

Accordingly, the main model estimation is conducted using a mixed logit model, also referred to as a random-parameters logit (RPL) model. This specification allows one or more preference parameters to vary randomly across individuals, thereby relaxing the independence of irrelevant alternatives (IIA) assumption inherent in the multinomial logit model and enabling the explicit modelling of preference heterogeneity among respondents (Scarpa, Thiene and Train, 2008[41]).

This modelling approach involves estimating unconditional choice probabilities obtained by integrating the conditional choice probabilities over the distribution of random preference parameters β. As this integration does not yield a closed-form solution, the unconditional probability is expressed as an integral over the individual-specific heterogeneity parameters embedded in the joint probability function.

Estimation therefore relies on a simulated maximum likelihood framework, following McFadden and Train (2010[42]). In this approach, the integral is approximated numerically by drawing repeated values from the assumed distributions of the random parameters and averaging the resulting conditional probabilities across these draws, thereby replacing the continuous integral with a discrete summation. In this study, the simulation was implemented using 500 Modified Latin Hypercube Sampling (MLHS) draws per random parameter.

In the context of this study, the deterministic component of utility is specified as follows:

$$V = \alpha_1\,\mathrm{ASC}_{\mathrm{current\_option}} + \alpha_2\,\mathrm{ASC}_{\mathrm{option\_B}} + \alpha_3\mathrm{ASC}_{\mathrm{current\_option}} \times \mathrm{Canada} + \alpha_4\,\mathrm{ASC}_{\mathrm{option\_B}} \times \mathrm{Canada} + \alpha_5\,\mathrm{ASC}_{\mathrm{current\_option}} \times \mathrm{Denmark} + \alpha_6\,\mathrm{ASC}_{\mathrm{option\_B}} \times \mathrm{Denmark} + \alpha_7\,\mathrm{ASC}_{\mathrm{current\_option}} \times \mathrm{Japan} + \alpha_8\,\mathrm{ASC}_{\mathrm{option\_B}} \times \mathrm{Japan} + \alpha_9\,\mathrm{ASC}_{\mathrm{current\_option}} \times \mathrm{Netherlands} + \alpha_{10}\,\mathrm{ASC}_{\mathrm{option\_B}} \times \mathrm{Netherlands} + \alpha_{11}\,\mathrm{ASC}_{\mathrm{current\_option}} \times \mathrm{Poland} + \alpha_{12}\,\mathrm{ASC}_{\mathrm{option\_B}} \times \mathrm{Poland} + \alpha_{13}\,\mathrm{ASC}_{\mathrm{current\_option}} \times \mathrm{Spain} + \alpha_{14}\,\mathrm{ASC}_{\mathrm{option\_B}} \times \mathrm{Spain} + \alpha_{15}\,\mathrm{ASC}_{\mathrm{current\_option}} \times \mathrm{Swizterland} + \alpha_{16}\,\mathrm{ASC}_{\mathrm{option\_B}} \times \mathrm{Swizterland} + \alpha_{17}\,\mathrm{ASC}_{\mathrm{current\_option}} \times \mathrm{UK} + \alpha_{18}\,\mathrm{ASC}_{\mathrm{option\_B}} \times \mathrm{UK} + \beta_1\,Flare\ up\ frequency + \beta_2\,Flare\ up\ visible\ in\ the\ Face + \beta_3\,Flare\ up\ in\ other\ visible\ areas + \beta_4\,Severe\ flare\ up + \beta_5\,extra\ monthly\ expenditure \quad (2)$$

Where the α coefficients are associated with the alternative-specific constants (ASCs) for the status quo ("current") option and Option B, with Option C serving as the reference alternative. The ASCs capture intrinsic preferences for each alternative that are not explained by the observed attributes included in the utility specification. Country effects are incorporated through a set of dummy variables, coded as one for respondents from a given country and zero otherwise, and interacted with the ASCs to allow for systematic cross-country differences in baseline preferences.

The following parameters are specified as random and assumed to follow a normal distribution: α_1, α_2, β_1, β_2, β_3, and β_4. All remaining coefficients are treated as fixed. This specification was selected following iterative model estimation and assessment, based on standard goodness-of-fit criteria (including the AIC and BIC criteria), statistical significance of estimated parameters, and the need to avoid convergence problems during estimation.

At the unconditional level, WTP estimates are derived as the ratio of each non-monetary attribute coefficient β_k(excluding coefficients associated with alternative-specific constants) to the coefficient on the monetary attribute, namely the additional monthly expenditure (β_5). Specifically, the marginal WTP for attribute k is calculated as:

$$WTP_k = -\beta_k / \beta_5 \quad (3)$$

Furthermore, estimation was conducted in WTP space rather than in preference space. In WTP-space estimation, monetary valuations for the non-cost attributes are estimated directly rather than deriving WTP measures ex post as ratios of estimated preference coefficients. This approach facilitates interpretation and can improve numerical stability when the primary interest lies in monetary valuation.

Following estimation of unconditional WTP over the whole sample, individual-specific conditional WTP measures were subsequently derived, conditional on respondents' observed choice sequences. This procedure follows the approach outlined in Hess (Hess, 2007[43]). Specifically, the expected value of the individual-specific parameter vector β, conditional on respondent n's observed choices $y_n$and the set of alternatives characterised by x_n, is given by:

$$[\beta|y_n,\ x_n] = \frac{\int \beta \prod_{t=1}^{T}\prod_{j=1}^{J}\left[\frac{\exp(x'_{njt}\beta)}{\sum_{j=1}^{J}\exp(x'_{njt}\beta)}\right]^{y_{njt}} f(\beta|\Theta)d\beta}{\int \prod_{t=1}^{T}\prod_{j=1}^{J}\left[\frac{\exp(x'_{njt}\beta)}{\sum_{j=1}^{J}\exp(x'_{njt}\beta)}\right]^{y_{njt}} f(\beta|\Theta)d\beta} \quad (4)$$

In addition, survey sampling weights were applied in the calculation of weighted WTP averages per country to ensure that the resulting estimates are representative of the target populations. Each respondent was assigned a post-stratification weight designed to correct for potential sampling imbalances, including the over- or under-representation of specific demographic groups.

Model estimations were conducted separately for the sensitised and non-sensitised samples. For the non-sensitised sample, the risk of becoming sensitised constitutes a key attribute of the valuation exercise. In this context, sensitisation-related outcomes experienced during the elicitation phase—namely the frequency, severity, and location of flare-ups—are conditional on the probability of sensitisation occurring in the first place. WTP estimates for this group therefore reflect valuations under uncertainty, capturing individuals' preferences over reductions in the risk of future sensitisation and its associated health consequences. It is accordingly important that the estimation framework explicitly accounts for this probabilistic context when deriving WTP measures.

There are several approaches for incorporating risk into stated-preference models (see, for example, (Glenk and Colombo, 2013[44]; Harrison et al., 2014[45]; Wu, E. and Schaafsma, 2022[46]). In this study, the estimation reported in Section 5 adopts an expected utility framework, consistent with Glenk and Colombo (2013[44]).

Within this framework, utility is specified as:

$$\begin{aligned} V = {} & \alpha_1\ \mathrm{ASC}_{\mathrm{current\_option}} + \alpha_2\ \mathrm{ASC}_{\mathrm{option\_B}} + \alpha_3 \mathrm{ASC}_{\mathrm{current\_option}} \times\ \mathrm{Canada} + \\ & \alpha_4\ \mathrm{ASC}_{\mathrm{option\_B}} \times \mathrm{Canada} + \alpha_5\ \mathrm{ASC}_{\mathrm{current\_option}} \times \mathrm{Denmark} + \alpha_6\ \mathrm{ASC}_{\mathrm{option\_B}} \times \\ & \mathrm{Denmark} + \alpha_7\ \mathrm{ASC}_{\mathrm{current\_option}} \times \mathrm{Japan} + \alpha_8\ \mathrm{ASC}_{\mathrm{option\_B}} \times \mathrm{Japan} + \\ & \alpha_9\ \mathrm{ASC}_{\mathrm{current\_option}} \times \mathrm{Netherlands} + \alpha_{10}\ \mathrm{ASC}_{\mathrm{option\_B}} \times \mathrm{Netherlands} + \\ & \alpha_{11}\ \mathrm{ASC}_{\mathrm{current\_option}} \times \mathrm{Poland} + \alpha_{12}\ \mathrm{ASC}_{\mathrm{option\_B}} \times \mathrm{Poland} + \alpha_{13}\ \mathrm{ASC}_{\mathrm{current\_option}} \times \\ & \mathrm{Spain} + \alpha_{14}\ \mathrm{ASC}_{\mathrm{option\_B}} \times \mathrm{Spain} + \alpha_{15}\ \mathrm{ASC}_{\mathrm{current\_option}} \times \mathrm{Swizterland} + \\ & \alpha_{16}\ \mathrm{ASC}_{\mathrm{option\_B}} \times \mathrm{Swizterland} + \alpha_{17}\ \mathrm{ASC}_{\mathrm{current\_option}} \times \mathrm{UK} + \alpha_{18}\ \mathrm{ASC}_{\mathrm{option\_B}} \times \mathrm{UK} + \\ & \beta_1(RISK \times Flare\ up\ duration) + \beta_2(RISK \times Flare\ up\ visible\ in\ the\ Face) + \\ & \beta_3(RISK \times Flare\ up\ in\ other\ visible\ areas) + \beta_4(RISK \times Severe\ flare\ up) + \\ & \beta_5\ extra\ monthly\ expenditure \end{aligned} \quad (5)$$

In this specification, RISK denotes the lifetime probability of becoming sensitised, and is coded as a categorical variable of three possible categories: 10% risk, 20% risk or 30% risk. Risk enters the utility function multiplicatively, interacting with each sensitisation outcome attribute. This reflects the fact that, for non-sensitised individuals, flare-up characteristics—namely frequency, severity, and visibility—are only realised conditional on becoming sensitised. The resulting utility therefore represents expected utility, with outcome-specific disutility weighted by the probability of sensitisation.

In the context of the present study, all four sensitisation outcome attributes presented to non-sensitised respondents are subject to this risk uncertainty. This interaction-based formulation ensures that willingness-to-pay estimates for the non-sensitised sample appropriately reflect valuations under risk, rather than valuations of outcomes assumed to occur with certainty.

In the main analysis for the non-sensitised sample, the risk reduction is always interacted with the risk of a flare-up which means it is not possible to fully determine the relative impact on the valuation of the risk of being sensitised versus the valuation of a reduced flare-up risk if sensitised. Therefore, complementary analysis was performed, examining whether non-sensitised participants value risk independently of outcome attributes based on a Direct Utility Model are presented in Annex. The findings provide evidence supporting the assumption that the risk of skin sensitisation—and, by implication, cases involving flare-ups—is, at least in part, valued independently of uncertainty in other attribute outcomes. For the main analysis in this paper, the expected utility model was selected as it performed well statistically, allowed for the development of statistical cases that included several attributes (frequency, severity, and location) and is also consistent with the other SWACHE surveys that relied on DCE elicitation methods (Appéré et al., 2023[47]; Herrera-Araujo et al., 2026[48]) as well as aligned with standard approaches in health and environmental risk valuation (Harrison et al., 2014[45]; Glenk and Colombo, 2013[44]; Wu, E. and Schaafsma, 2022[46]).

5 Results

Table 12 summarises respondents' answers to the payment-principle question. Specifically, participants were asked: "Taking into account the information presented previously, would you be willing, in principle, to increase your monthly spending to switch to products labelled 'Skin Sensitiser Free'?". The willingness-to-pay (WTP) analysis is conducted using responses from participants who indicated that they would be willing to pay in principle, as well as those who responded "Yes, but it depends on how much" to this question.

Table 12. Responses to payment principle question

	Sensitised				Non-sensitised				Total
	No	Don't know	Yes	Sub-sample	No	Don't know	Yes	Sub-sample	
	(Percentage of sub-sample)			(No. of obs.)	*(Percentage of sub-sample)*			(No. of obs.)	(No. of obs.)
Canada	10.0%	5.3%	84.7%	780	14.8%	11.4%	73.9%	440	1 220
Denmark	7.7%	7.4%	84.9%	806	11.7%	10.3%	78.0%	409	1 215
Japan	15.0%	13.6%	71.4%	755	21.5%	19.8%	58.7%	460	1 215
Netherlands	9.3%	6.3%	84.4%	777	13.4%	8.6%	78.0%	440	1 217
Poland	9.4%	8.8%	81.8%	809	15.2%	19.9%	65.0%	408	1 217
Spain	10.3%	8.4%	81.3%	766	13.4%	16.7%	69.8%	454	1 220
Switzerland	13.0%	5.7%	81.2%	751	14.6%	8.4%	77.0%	453	1 204
United Kingdom	8.4%	5.6%	86.0%	713	15.0%	5.9%	79.0%	505	1 218
United States	11.6%	4.0%	84.4%	681	14.7%	9.3%	76.0%	537	1 218
Total	**10.5%**	**7.3%**	**82.2%**	**6 838**	**15.0%**	**12.1%**	**72.9%**	**4 106**	**10 944**

Table 12 indicates that responses rejecting the payment principle ("no" responses) account for a relatively small share of both the sensitised and non-sensitised sub-samples. Among sensitised respondents, such responses represent approximately 10.5% on average ranging from 7.7% in Denmark to 15.0% in Japan. The share of "no" responses is somewhat higher among non-sensitised respondents, averaging around 15% across countries, with Japan again showing a relatively high proportion.

5.1. Main Results

This section presents the main results of the model estimation based on the linear expected-utility specification described in Section 4, using a mixed logit model (also known as random parameter logit model), and are reported separately for sensitised and non-sensitised respondents.

Results for randomised parameters (i.e. the DCE attributes) are displayed as the mean and standard errors of their respective distribution. Accordingly, each randomised variable is characterised by a distribution of coefficients rather than a single point estimate. As a consequence, the resulting willingness-to-pay (WTP) measures also take the form of distributions, rather than single-valued estimates. In this context, each WTP estimate represents the marginal value associated with avoiding a given outcome attribute (for the

sensitised sample) or with avoiding a 10-percentage-point change in the risk of a given outcome attribute (for the non-sensitised sample). These attributes include the number of days with flare-ups (i.e. frequency), visibility of flare-ups on the face visibility on other parts of the body, and the severity of flare-ups. Results for fixed control variables (e.g. extra monthly expenditures) included in the model correspond to regression coefficients. Estimates of the alternative-specific constants (ASCs) should not be interpreted as willingness-to-pay (WTP) measures.

Results are presented using unconditional estimates, reflecting average preferences across the sample rather than individual-specific estimates, and are obtained by integrating over the distribution of model parameters. All models were estimated using the *Apollo* package in R. This approach allows the resulting willingness-to-pay (WTP) estimates to be interpreted as population-average values. All results are presented in 2023 USD PPP[3]. For clarity 2023 USD PPP is simply written USD in the following sections.

5.1.1. Sensitised sample

Table 13 presents the estimation results for the sub-sample of sensitised participants, following the exclusion of speeders and the application of additional quality-control criteria. Results for randomised parameters are displayed as mean WTP, whereas estimates of fixed control variables included in the model refer to regression (or utility) coefficients.[4]

The results indicate that sensitised respondents exhibit a WTP of USD 0.11 per month to avoid one additional day with a flare-up. Participants also report a WTP of USD 5.50 per month to avoid a flare-up occurring on the face compared with USD 1.40 per month to avoid visibility in other body areas; the latter estimate is not statistically significant.

The estimated WTP for avoiding severe flare-ups is positive but not statistically significant, reflecting substantial preference heterogeneity within the sensitised sample (mean = 1.86; standard deviation = 26.84). As expected, the coefficient on the additional monthly expenditure attribute is negative and statistically significant in line with economic theory.

Inspection of the coefficients on the alternative-specific constants (ASCs) provides insight into respondents' overall choice tendencies. Overall, sensitised participants were less likely to select the status quo option indicating a general preference for improvements over no change. At the aggregate level, there was no statistically significant difference in preferences between the two improvement alternatives (Option B and Option C) despite Option C offering greater health improvements at a higher cost. However, this pattern masks important cross-country variation.

In Japan, respondents showed lower aversion to the status quo and a statistically significant preference for Option B relative to Option C suggesting greater sensitivity to higher costs associated with more extensive improvements. By contrast respondents in Spain displayed a stronger preference for Option C over Option B, indicating a greater willingness to accept higher costs in exchange for more substantial health benefits.

The estimated standard deviations of the random parameters are all statistically significant, confirming the presence of substantial preference heterogeneity and supporting the relaxation of the preference homogeneity assumption underlying the WTP estimates. For sensitised

[3] Conversions to 2023 USD PPP have been conducted using PPP figures from the OECD Dataset: Annual Purchasing Power Parities and exchange rates, as of September 2025.

[4] However, alternative specific constant (ASC) estimates should not be interpreted as WTPs.

participants, the alternative-specific constant (ASC) associated with the status quo (current option) is negative and statistically significant, indicating a strong aversion to maintaining existing conditions. By contrast, the ASC associated with Option B is negative but not statistically significant. Taken together these results suggest that on average participants exhibit a clear preference for improvement relative to the status quo but do not differentiate significantly between Option B (residual mild symptoms) and Option C (no symptoms at a higher cost).

Table 13. Mixed logit model estimation among the sensitised sample

Parameter	Type	Estimate	Confidence Interval	Robust S.E.	Robust T-Ratio.
WTP to avoid one extra day of flare-up	Mean	0.11	[0.05- 0.18]	0.03	3.29
	Standard Deviation	0.53	[0.41- 0.65]	0.06	8.57
WTP to avoid flare-up visible in the face (compared to non-visible areas)	Mean	5.54	[1.89- 9.20]	1.87	2.97
	Standard Deviation	13.93	[6.95 -20.91]	3.56	-3.91
WTP to avoid flare-up in other visible areas (compared to non-visible areas)	Mean	1.38	[-0.85- 3.61]	1.14	1.21
	Standard Deviation	0.59	[3.92 -5.10]	2.30	-0.26
WTP to avoid severe flare-up (compared to non-severe, i.e. mild or moderate)	Mean	1.86	[-2.85 -6.58]	2.40	0.78
	Standard Deviation	26.84	[17.22 -36.46]	4.91	5.47
Extra monthly expenditure (USD PPP)	Fixed	-0.05	[-0.06 -0.05]	0.00	-20.14
ASC_current option	Mean	-3.90	[-4.68 -3.13]	0.40	-9.84
	Standard Deviation	4.87	[4.49 -5.24]	0.19	25.28
ASC_option B	Mean	-0.25	[-0.79 -0.30]	0.28	-0.89
	Standard Deviation	3.17	[2.98 -3.37]	0.10	31.61
ASC_current option × Canada	Fixed	0.04	[-0.98 -1.06]	0.52	0.08
ASC_option B × Canada	Fixed	0.18	[-0.52 -0.88]	0.36	0.50
ASC_current option × Denmark	Fixed	0.61	[-0.44 -1.67]	0.54	1.14
ASC_option B × Denmark	Fixed	0.41	[-0.29 -1.11]	0.36	1.15
ASC_current option × Japan	Fixed	1.65	[0.59 -2.71]	0.54	3.06
ASC_option B × Japan	Fixed	0.85	[0.13 -1.57]	0.37	2.32
ASC_current option × Netherlands	Fixed	-0.58	[-1.56 -0.39]	0.50	-1.18
ASC_option B × Netherlands	Fixed	0.18	[-0.51 -0.88]	0.35	0.52
ASC_current option × Poland	Fixed	0.67	[-0.31 -1.66]	0.50	1.34
ASC_option B × Poland	Fixed	-0.28	[-1.01 -0.46]	0.38	-0.74
ASC_current option × Spain	Fixed	0.02	[-0.98 -1.03]	0.51	0.05
ASC_option B × Spain	Fixed	-0.76	[-1.49 -0.02]	0.37	-2.02
ASC_current option × Switzerland	Fixed	-0.60	[-1.60 -0.39]	0.51	-1.18
ASC_option B × Switzerland	Fixed	-0.64	[-1.34 -0.07]	0.36	-1.78
ASC_current option × UK	Fixed	1.05	[-0.02 -2.11]	0.54	1.93
ASC_option B × UK	Fixed	0.56	[-0.15 -1.26]	0.36	1.55
Log-Likelihood	-10 159.67				
AIC	20 377.34				
BIC	20 597.5				
N	2 440				

Note: WTPs are expressed in USD PPP per month. ASC stands for alternative specific constant and should not be interpreted as WTPs. Respondents who failed key attention and comprehension checks were excluded from the analysis. Specifically, participants were removed if they did not correctly answer the attention-check question: "In order to demonstrate that you are truly paying attention to the survey, please select the response 'Not much'."

5.1.2. Non-sensitised sample

For the non-sensitised sample (Table 14), the results indicate strong preferences across all attributes considered, consistent with a priori expectations. The estimated standard deviations are statistically significant for all attributes, including flare-up severity, confirming the presence of substantial preference heterogeneity within the non-sensitised sample. As observed for the sensitised sample, respondents exhibit a strong aversion to the status quo option while no statistically significant difference in preferences is observed between Option B and Option C.

For the non-sensitised sample, respondents show a WTP of USD 0.15 per month to reduce the risk of experience a one-day flare-up by 10-percentage-points. The estimated WTP to reduce the risk of any flare-up being visible on the face by 10 percentage points is approximately USD 4.50 per month. In addition, the WTP associated with reducing severe flare-ups by 10 percentage points is positive and statistically significant exceeding USD 1 per month. As expected, the coefficient on the additional monthly expenditure attribute is negative and statistically significant providing reassurance regarding the internal consistency of the model.

Inspection of the coefficients on the ASCs provides insight into respondents' overall choice patterns. Overall, participants showed a strong aversion to the status quo option while no statistically significant difference was observed in preferences between Option B and Option C at the aggregate level. However, this pattern varies markedly across countries. Respondents in the United Kingdom displayed the strongest relative preference for Option B over Option C whereas respondents in Denmark showed the opposite pattern with a statistically significant preference for Option C relative to Option B.

Table 14. Mixed logit model estimation among the non-sensitised sample

Expected Utility Risk (unconditional estimates)

Parameter	Type	Estimate	Confidence Interval	Robust S.E.	Robust T-Ratio.
WTP to decrease the risk of one extra day of flare-up by 10 percentage points	Mean	0.15	[0.12 -0.18]	0.02	9.62
	Standard Deviation	0.28	[0.23 -0.33]	0.03	10.91
WTP to decrease the risk of flare-up visible in the face (compared to non-visible areas) by 10 percentage points	Mean	4.45	[3.09 -5.81]	0.69	6.42
	Standard Deviation	12.01	[9.91 -14.10]	1.07	-11.24
WTP to decrease the risk of flare-up in other visible areas (compared to non-visible areas) by 10 percentage points	Mean	2.69	[1.73- 3.65]	0.49	5.49
	Standard Deviation	6.40	[4.10 - 8.70]	1.17	5.45
WTP to decrease the risk of severe flare-up (compared to non-severe, i.e. mild or moderate) by 10 percentage points	Mean	1.35	[0.21 -2.48]	0.58	2.33
	Standard Deviation	11.77	[9.73 -13.81]	1.04	11.31
Extra monthly expenditure (USD PPP)	Fixed	-0.06	[-0.06 -0.05]	0.00	-27.41
ASC_current option	Mean	-2.45	[-3.08 -1.81]	0.32	-7.57
	Standard Deviation	5.52	[5.17 -5.86]	0.18	31.40
ASC_option B	Mean	-0.07	[-0.47 -0.32]	0.20	-0.37
	Standard Deviation	3.58	[3.42 -3.74]	0.08	43.34
ASC_current option × Canada	Fixed	-0.72	[-1.54 -0.10]	0.42	-1.72
ASC_option B × Canada	Fixed	0.72	[0.19 -1.24]	0.27	2.69
ASC_current option × Denmark	Fixed	-0.99	[-1.94 -0.03]	0.49	-2.02
ASC_option B × Denmark	Fixed	0.04	[-0.51 -0.58]	0.28	0.14
ASC_current option × Japan	Fixed	0.77	[-0.05 -1.59]	0.42	1.83
ASC_option B × Japan	Fixed	1.05	[0.49 -1.62]	0.29	3.65
ASC_current option × Netherlands	Fixed	-1.53	[-2.68-0.39]	0.58	-2.63
ASC_option B × Netherlands	Fixed	0.36	[-0.18 -0.90]	0.28	1.31
ASC_current option × Poland	Fixed	1.25	[0.24 -2.25]	0.51	2.44
ASC_option B × Poland	Fixed	0.43	[-0.13 -0.98]	0.28	1.52
ASC_current option × Spain	Fixed	-0.73	[-1.63 -0.18]	0.46	-1.57
ASC_option B × Spain	Fixed	-0.28	[-0.83 -0.27]	0.28	-1.01
ASC_current option × Switzerland	Fixed	-0.23	[-1.11 -0.65]	0.45	-0.51
ASC_option B × Switzerland	Fixed	0.12	[-0.43 -0.67]	0.28	0.43
ASC_current option × UK	Fixed	0.21	[-0.77 -1.19]	0.50	0.42
ASC_option B × UK	Fixed	1.14	[0.59 -1.68]	0.28	4.09
Log-Likelihood	-19 617.8				
AIC	39 293.6				
BIC	39 534.3				
N	4 962				

Note: WTPs are expressed in 2023 USD PPP per month. ASC stands for alternative specific constant and should not be interpreted as WTPs. Respondents who failed key attention and comprehension checks were excluded from the analysis. Specifically, participants were removed if they did not correctly answer the attention-check question: "In order to demonstrate that you are truly paying attention to the survey, please select the response 'Not much'." In addition, for the non-sensitised sample only respondents were excluded if they failed to demonstrate adequate understanding of probabilistic information, as indicated by an incorrect response to the question: "In a population of 1 000 people, how many people do you expect to have skin sensitisation if there is a 20% risk of becoming sensitised?"

5.2. Country-Level Estimates

Based on the unconditional estimates reported in Table 13 and Table 14, individual-level WTP measures were derived and aggregated to produce country-level averages which are presented below. Country-level average WTPs were computed using the sampling weights provided by Ipsos to ensure representativeness. The analysis is based on the samples subject to the full set of quality-control exclusions, in addition to the removal of speeders. Given the reliance on unconditional estimates, individual WTP values were calculated at the post-estimation stage and subsequently averaged within countries using survey weights. The resulting weighted average WTP estimates are reported in Table 15 and Table 16.

Within the sensitised sample WTP to avoid one additional day of flare-up is slightly lower in Switzerland (USD 0.10 per month) and higher in Japan (USD 0.13 per month). Japan also presents higher WTP values for avoiding flare-ups visible on the face (USD 5.80 per month) and for avoiding severe flare-ups (USD 3.34 per month). By contrast, Canada and Denmark show results broadly in line with the sample average with WTP estimates of USD 0.12 and USD 0.11 per month, respectively for avoiding one additional flare-up day, and USD 5.53 and USD 5.43 per month respectively, for avoiding facially visible flare-ups. In both Canada and Denmark, the WTP estimates for avoiding severe flare-ups are positive but not statistically significant.

Table 15. Country-level monthly willingness to pay to avoid skin sensitisation attribute among the sensitised sample (USD)

		Severity of each flare-up	Location of each flare-up	
			Visible in face	Other visible areas
	WTP to avoid one extra day of flare-up [CI]	WTP to avoid one extra severe case [CI]	WTP to avoid case being visible in face [CI]	WTP to avoid case, being in other visible areas [CI]
Canada	0.116 [0.086 -0.145]	0.576 [-0.451-1.60]	5.53 [5.14 -5.91]	1.38 [1.37 -1.39]
Denmark	0.110 [0.083 -0.137]	0.864 [-0.091 -1.82]	5.43 [5.04 -5.81]	1.38 [1.37-1.39]
Japan	0.133 [0.108 -0.158]	3.34 [2.23-4.45]	5.80 [5.38-6.21]	1.37 [1.36 -1.38]
Netherlands	0.112 [0.088 -0.137]	2.00 [1.27-2.73]	5.59 [5.23-5.96]	1.38 [1.37 -1.39]
Poland	0.104 [0.073 -0.135]	1.58 [0.666-2.49]	5.38 [4.97-5.79]	1.38 [1.37 -1.39]
Spain	0.106 [0.081 -0.131]	1.94 [1.01-2.86]	5.36 [4.96-5.76]	1.39 [1.38 -1.40]
Switzerland	0.101 [0.074 -0.128]	2.40 [1.44 -3.35]	5.63 [5.28-5.97]	1.38 [1.37 -1.39]
United Kingdom	0.110 [0.080 -0.140]	1.70 [0.763-2.64]	5.52 [5.10 -5.95]	1.38 [1.38 -1.39]
United States	0.110 [0.083 -0.137]	1.71 [0.651-2.77]	5.78 [5.39-6.16]	1.38 [1.37 -1.39]

Note: Willingness-to-pay estimates are expressed in 2023 USD PPP per month. Values in local currencies can be found in Annex A.

Within the non-sensitised sample, results refer to a 10 percentage point reduction in the risk of a flare-up. Findings indicate that the Netherlands present a relatively higher willingness to pay (WTP) to avoid one additional day of flare-up (USD 0.17 per month), while Japan shows a slightly lower estimate (USD 0.14 per month). Canada records the highest WTP for avoiding flare-ups visible on the face (USD 4.72 per month). By contrast, Poland reports the lowest WTP for avoiding severe flare-ups, at USD 0.97 per month.

Table 16. Country-level monthly willingness to pay to avoid the risk of skin sensitisation attribute among the non-sensitised sample (USD)

	WTP to avoid one extra day of flare-up [CI]	Severity of each flare-up	Location of each flare-up	
			Visible in face	Other visible areas
		WTP to avoid one extra severe case [CI]	WTP to avoid case being visible in face [CI]	WTP to avoid case being in other visible areas [CI]
Canada	0.149 [0.140- 0.159]	1.21 [0.897-1.53]	4.72 [4.40- 5.04]	2.67 [2.54 -2.81]
Denmark	0.148 [0.137 -0.158]	1.41 [1.07 -1.76]	4.05 [3.64 -4.46]	2.67 [2.51 -2.82]
Japan	0.143 [0.133 -0.154]	1.29 [0.926 -1.65]	4.56 [4.20 -4.92]	2.69 [2.55 -2.83]
Netherlands	0.169 [0.160 -0.177]	1.53 [1.21 -1.86]	4.65 [4.32 -4.98]	2.71 [2.58 -2.85]
Poland	0.136 [0.126 -0.147]	0.962 [0.615 -1.31]	4.50 [4.17 -4.83]	2.65 [2.52 -2.77]
Spain	0.152 [0.140 -0.163]	1.55 [1.16 -1.94]	4.23 [3.84 -4.62]	2.59 [2.42 -2.75]
Switzerland	0.149 [0.137 -0.160]	1.36 [0.982 -1.73]	4.54 [4.15 -4.93]	2.58 [2.43 -2.73]
United Kingdom	0.152 [0.141 -0.162]	1.43 [1.08 -1.79]	4.64 [4.26 -5.02]	2.77 [2.63 -2.90]
United States	0.146 [0.135- 0.157]	1.14 [0.757-1.53]	4.21 [3.84 -4.59]	2.74 [2.59-2.89]

Note: For the non-sensitised sample, willingness-to-pay estimates refer to avoiding a 10 % risk of skin sensitisation attribute. Values are expressed in 2023 USD PPP per month. Values in local currencies can be found in Annex A.

5.3. Determinants of WTP in the Discrete Choice Experiment

Table 17 presents an indicative analysis on the determinants of estimated individual WTP derived from the DCE. The dependent variables capture WTP for reductions in flare-up frequency avoidance of visible flare-ups (face and other locations) reductions in severity. Coefficients are reported as marginal WTP in USD (PPP) per month. Statistical significance is assessed using t-statistics.

Across countries most estimated coefficients are not statistically significant as reflected in t-statistics that generally fall below the conventional threshold of |1.96|. For example, while Japan exhibits positive coefficients for WTP to avoid flare-ups visible on the face (β = 0.93) and for avoiding more severe flare-ups (β = 0.47) neither estimate reaches statistical significance with corresponding t-values of 1.79 and 0.85, respectively.

Among the individual-level covariates income and to a lesser extent education emerge as predictors of higher WTP although not across all WTPs assessed. Income has a consistently positive and statistically significant association with WTP to an extra-day of flare-up. Educational attainment also shows a positive association with WTP most notably for reductions in flare-up frequency. In addition, education has a positive and marginally significant effect on WTP to reduce the probability of sensitisation. By contrast, the estimated effect of education on WTP for reducing flare-up severity is negative suggesting heterogeneity in how educational attainment relates to valuations across different health attributes.

Sensitised individuals show significantly lower marginal WTP across all adverse outcomes considered. Specifically WTP is lower for reductions in flare-up days (β = –0.21; t = –33.75) avoidance of flare-ups visible on the face (β = –3.89; t = –24.33) avoidance of flare-ups in other visible body locations (β = –3.49; t = –204.04) and reductions in flare-up severity (β = –3.13; t = –14.85). This result shows that individuals who already experience skin sensitisation show diminishing marginal valuation, which could reflect adaptation effects or a lower perceived benefit from incremental improvements relative to individuals who are not skin-sensitised.

Other psychosocial factors such as having accurate or enough information and confidence in that information are generally associated with positive albeit small and sometimes statistically significant effects on WTP. Notably respondents who reported that they behaved “as in real life” when completing the survey showed a higher WTP to reduce the frequency of flare ups (β = 0.02; t = 2.83) while those who perceived the information provided as accurate showed a higher WTP to avoid flare-ups visible on the face (β = 0.48; t = 2.51). These findings suggest that greater engagement with and confidence in the survey task may be associated with higher stated valuations.

In summary, the analysis identifies income, educational attainment, sensitisation status and perceived information quality as important drivers of WTP. The absence of consistently statistically significant differences at the country level suggests that variation in valuations is greater within countries than between them. This finding emphasises the importance of accounting for heterogeneity across population subgroups when designing health policies or valuation-based interventions rather than relying solely on country-level averages.

Table 17. Determinants on individual WTP derived from DCE

Variable		Pooled sensitised and non-sensitised sample				Non-sensitised sample
		WTP to avoid				WTP to reduce the probability of getting sensitised by 10 p.p
		One extra day of flare-up	Case being visible in face	Case in other visible areas	One extra severe case	
Canada	Beta	-0.03	0.06	0.00	-0.81	-0.99
	s.e.	0.01	0.45	0.05	0.46	0.54
	t	-1.84	0.13	-0.10	-1.75	-1.84
Denmark	Beta	-0.02	-0.28	0.02	-0.77	-1.16
	s.e.	0.01	0.49	0.05	0.49	0.59
	t	-1.04	-0.56	0.30	-1.58	-1.97
Japan	Beta	0.03	0.93	0.04	0.47	0.20
	s.e.	0.02	0.52	0.05	0.55	0.61
	t	1.59	1.79	0.79	0.85	0.33
Netherlands	Beta	0.01	0.37	-0.05	-0.33	-0.92
	s.e.	0.01	0.47	0.05	0.46	0.56
	t	0.96	0.80	-0.95	-0.71	-1.66
Poland	Beta	-0.03	0.02	-0.01	-1.11	-1.25
	s.e.	0.02	0.49	0.05	0.49	0.58
	t	-2.26	0.04	-0.17	-2.29	-2.15
Spain	Beta	-0.02	-0.37	-0.05	-0.67	-1.53
	s.e.	0.01	0.49	0.05	0.50	0.59
	t	-1.44	-0.76	-1.00	-1.33	-2.59
Switzerland	Beta	-0.02	0.15	0.01	-0.29	-0.93
	s.e.	0.02	0.49	0.05	0.50	0.59
	t	-1.21	0.30	0.27	-0.58	-1.58
United States	Beta	-0.05	-0.28	-0.01	-1.06	-1.45
	s.e.	0.01	0.48	0.05	0.51	0.55
	t	-3.28	-0.57	-0.25	-2.09	-2.64
Age	Beta	0.00	0.00	0.00	-0.02	-0.02
	s.e.	0.00	0.01	0.00	0.01	0.01
	t	-1.10	0.47	-1.10	-2.84	-2.01
Female	Beta	0.01	0.04	0.02	0.16	0.02
	s.e.	0.01	0.20	0.02	0.22	0.25
	t	2.08	0.18	1.10	0.74	0.09
Has children	Beta	-0.01	0.24	-0.02	-0.23	-0.51
	s.e	0.01	0.25	0.03	0.26	0.31
	t	-1.64	0.98	-0.61	-0.89	-1.66
Employed	Beta	0.00	0.32	0.02	-0.29	0.74
	s.e.	0.01	0.23	0.03	0.24	0.28
	t	0.13	1.42	0.64	-1.24	2.64

Income band	Beta	0.01	0.05	0.01	0.22	0.61
	s.e.	0.00	0.11	0.01	0.11	0.14
	t	4.21	0.46	0.56	1.93	4.35
Education level	Beta	0.02	0.13	0.01	-0.09	0.36
	s.e.	0.00	0.16	0.02	0.16	0.20
	t	4.51	0.85	0.81	-0.58	1.82
Sensitised	Beta	-0.21	-3.89	-3.49	-3.13	-
	s.e.	0.01	0.16	0.02	0.21	-
	t	-33.75	-24.33	-204.04	-14.85	-
Ease of choice	Beta	0.03	0.08	0.05	0.18	1.08
	s.e.	0.00	0.13	0.01	0.14	0.17
	t	6.11	0.64	3.23	1.27	6.38
Focused on choices only on themselves	Beta	-0.02	0.58	-0.02	0.06	-1.42
	s.e.	0.01	0.25	0.03	0.26	0.31
	t	-2.74	2.33	-0.74	0.24	-4.57
Previous knowledge level	Beta	-0.01	-0.03	0.02	-0.06	-0.30
	s.e.	0.00	0.12	0.01	0.13	0.16
	t	-2.02	-0.23	1.12	-0.42	-1.88
Post survey knowledge level	Beta	0.01	0.23	0.03	0.15	0.37
	s.e.	0.01	0.18	0.02	0.19	0.22
	t	2.06	1.24	1.61	0.78	1.65
Behaved as in real life	Beta	0.02	0.23	-0.01	0.33	0.10
	s.e.	0.01	0.16	0.02	0.17	0.20
	t	2.83	1.40	-0.74	1.90	0.49
Had enough info to decide	Beta	0.01	0.18	-0.02	0.44	0.13
	s.e.	0.01	0.17	0.02	0.18	0.21
	t	1.23	1.06	-1.02	2.50	0.62
Had accurate info to decide	Beta	0.01	0.48	0.02	0.16	0.39
	s.e.	0.01	0.19	0.02	0.19	0.21
	t	2.11	2.51	1.01	0.85	1.90
Feels confident in info provided	Beta	0.01	0.14	0.00	0.11	0.64
	s.e.	0.00	0.15	0.02	0.16	0.19
	t	1.69	0.97	-0.05	0.68	3.33
Constant	Beta	0.02	2.77	4.63	1.19	-2.11
	s.e.	0.03	1.10	0.12	1.10	1.32
	t	0.64	2.52	38.57	1.08	-1.60
Observations		7 402	7 402	7 402	7 402	4 962
R^2		0.15	0.05	0.76	0.04	0.05

5.4. Robustness checks

The following robustness checks further examine the stability and reliability of the main results under alternative sample restrictions and modelling assumptions. In particular, they assess

whether the findings are sensitive to data quality controls, respondent comprehension, and the specification of preference heterogeneity.

5.4.1. Additional samples exclusion

Robustness checks were undertaken by re-estimating the baseline model after excluding potentially problematic responses and by testing alternative specifications of the error-term distribution. First, observations completed in less than 48% of the median completion time were excluded from the analysis, consistent with SWACHE quality-control guidelines.

Second, completion times among respondents classified as “speeders” were compared between the sensitised and non-sensitised samples. As the latter group faced an additional attribute in the choice experiment, this comparison was used to assess whether differing task complexity affected completion speed. No statistically significant differences were found between the two groups. On this basis, the pooled sample median completion time of 17.7 minutes was used as the reference threshold for identifying speeders.

Additional exclusions were also examined to assess the robustness and reliability of the estimated results. Specifically, alternative model specifications were estimated after removing respondents who failed key attention and comprehension checks.

First, respondents were excluded if they did not correctly answer the attention-check question: “In order to demonstrate that you are truly paying attention to the survey, please select the response ‘Not much’.”

Second, for the non-sensitised sample only, respondents were excluded if they did not demonstrate adequate understanding of probabilistic information. This was assessed through an objective comprehension question: “In a population of 1 000 people, how many people do you expect to have skin sensitisation if there is a 20% risk of becoming sensitised?”, with incorrect responses indicating insufficient understanding of the risk attribute.

5.4.2. Alternative modelling assumption

Additional robustness checks were undertaken to examine the sensitivity of the results to the modelling assumptions. Mixed logit models were re-estimated under alternative distributional assumptions for the random WTP parameters, comparing the preferred normal specification with a uniform distribution. [5]

This exercise aimed to assess the extent to which the substantive conclusions on WTP depend on the assumed form and support of unobserved preference heterogeneity. While the uniform distribution imposes bounded heterogeneity, in contrast to the normal distribution which permits more extreme values in the tails, its application yielded some behaviourally implausible results in both sensitised and non-sensitised specifications. In particular, certain coefficients implied negative WTP for avoiding or reducing undesirable outcomes. Although the uniform specification led to marginal improvements in likelihood-based fit, these gains were not sufficient to compensate for the loss of theoretical consistency and behavioural plausibility. Accordingly, the normal distribution was retained as the preferred specification, with the uniform results interpreted as indicative of some sensitivity to distributional assumptions rather than as a superior modelling approach.

[5] Tables associated with these analyses are available upon request.

6 Recommended values for a representative case

In assessing the benefits of regulatory action targeting a skin-sensitising substance the relevant change in the health endpoint is the reduction in the expected number of skin flare-up cases over the assessment period. These avoided cases arise through two distinct pathways. First, for individuals who are already sensitised regulatory restrictions reduce the likelihood of subsequent exposure to the substance thereby lowering the expected incidence of additional flare-ups. Second for individuals who are not yet sensitised regulatory action reduces the probability of becoming sensitised in the first place. In both cases the intervention affects the overall expected number of sensitisations-related outcomes although the timing and manifestation of benefits may differ substantially between the two groups.

Notwithstanding these complexities the relevant physical health endpoint for regulatory appraisal remains the expected number of skin flare-up episodes before and after the proposed policy. Specifically for each year over the appraisal horizon the relevant outcome is the change in the expected number of flare-up episodes. This reflects reductions in episodes both among individuals who are already sensitised at the time the restriction is introduced and among individuals who in the absence of the restriction would have become sensitised in subsequent years and experienced flare-ups later.

Using the unit monthly WTP values by country reported in Table 15 and Table 16 (Section 5.2) total WTP estimates are calculated and presented in this penultimate section. Total WTP for each attribute is derived with reference to the payment schedule embedded in the study's valuation design and communicated to respondents. Specifically monthly WTP values are aggregated over a five-year period. The resulting total WTP estimates for *unit* changes in each attribute are reported in Tables 15 and 16. These total values form the basis for calculating the monetary value of representative cases involving skin-sensitisation-related flare-ups.

It is important to note that given the way attributes were described to respondents all attributes except one are expressed as unit values per case independent of duration. The exception is the frequency of flare-ups attribute, which captures a value per case-day. As a result, a representative case involving multiple flare-up days implies a proportional scaling of this value when estimating WTP to avoid the outcome. For the remaining attributes that are not explicitly frequency-related the estimated values can be interpreted as an additional valuation "premium" applied on top of the assumed frequency (in days) of a flare-up episode.

Table 18. Country-level willingness to pay over 5 years to avoid skin sensitisation attribute among the sensitised sample (USD)

	WTP to avoid one extra day of flare-up [CI]	Severity of each flare-up	Location of each flare-up	
			Visible in face	Other visible areas
		WTP to avoid one extra severe case [CI]	WTP to avoid case being visible in face [CI]	WTP to avoid case in other visible areas [CI]
Canada	6.94 [5.18; 8.70]	34.55* [-27.07; 96.17]	331.67 [308.55; 354.78]	82.81 [82.26; 83.37]
Denmark	6.61 [4.98; 8.24]	51.84* [-5.48; 109.15]	325.63 [302.53; 348.73]	82.89 [82.36; 83.42]
Japan	7.98 [6.48; 9.49]	200.37 [75.94; 164.07]	347.70 [322.53; 372.87]	82.17 [81.68; 82.66]
Netherlands	6.74 [5.27; 8.22]	120.01 [75.94; 164.07]	335.66 [314.00; 357.33]	82.65 [82.19; 83.11]
Poland	6.23 [4.40; 8.07]	94.77 [39.95; 149.59]	323.00 [298.36; 347.64]	82.80 [82283; 84.08]
Spain	6.38 [4.87; 7.89]	116.20 [60.89; 171.52]	321.69 [297.51; 345.86]	83.51 [82.93; 84.08]
Switzerland	6.07 [4.44; 7.69]	143.83 [86.69;200.97]	337.54 [316.81; 358.27]	82.82 [82.25; 83.39]
United Kingdom	6.57 [4.77; 8.37]	102.03 [45.78;158.29]	331.46 [305.87; 357.04]	83.09 [82.54; 83.64]
United States	6.61 [5.00; 8.21]	102.48 [39.06;165.90]	346.66 [323.44; 369.88]	82.59 [81.99; 83.18]
Cross-country average	6.68	97.74	333.45	82.81

Notes: WTP values are expressed in 2023 USD PPP and aggregated over a five-year period, consistent with the DCE valuation scenario. Aggregate values are obtained by converting monthly WTP estimates reported in Table 15 into total amounts over 60 months. Values may not exactly match those presented in Table 15 x 60 due to rounding. * The WTP to avoid one extra severe case for Canada and Denmark are not significant, and are not included in the cross-country average. The cross-country average is calculated as the simple average of the country values.

Table 19. Country-level willingness to pay over 5 years to avoid the risk of skin sensitisation attribute along the non-sensitised sample (USD)

	WTP to avoid one extra day of flare-up [CI]	Severity of each flare-up	Location of each flare-up	
			Visible in face	Other visible areas
		WTP to avoid one extra severe case [CI]	WTP to avoid case being visible in face [CI]	WTP to avoid case being in other visible areas [CI]
Canada	8.95 [8.38; 9.52]	72.89 [53.84; 91.94]	283.22 [263.83; 302.61]	160.42 [152.43; 168.41]
Denmark	8.88 [8.24; 9.51]	84.71 [64.03; 105.38]	243.03 [218.60; 267.46]	159.93 [150.65; 169.21]
Japan	8.61 [7.99; 9.22]	77.42 [55.56; 99.28]	273.58 [252.00; 295.16]	161.45 [153.30; 169.60]
Netherlands	10.12 [9.60; 10.63]	91.98 [72.64; 111.32]	278.93 [259.08; 298.78]	162.86 [154.94; 170.79]
Poland	8.18 [7.54; 8.83]	57.70 [36.88; 78.52]	269.98 [250.36; 289.60]	158.72 [151.06; 166.38]
Spain	9.10 [8.42; 9.77]	92.77 [69.38; 116.16]	253.58 [230.13; 277.02]	155.17 [145.44; 167.91]
Switzerland	8.92 [8.245; 8.59]	81.47 [58.91; 104.03]	272.47 [248.83; 296.10]	154.74 [145.76; 163.71]
United Kingdom	9.10 [8.47; 9.73]	85.87 [64.60; 107.15]	278.35 [278.35; 255.67]	166.05 [157.87; 174.22]
United States	8.76 [8.11; 9.41]	68.59 [45.41; 91.77]	252.89 [230.47; 275.31]	164.63 [155.62; 173.63]
Cross-country average	8.96	79.27	267.34	160.44

Note: For the non-sensitised sample, willingness-to-pay estimates refer to avoiding a 10 % risk of skin sensitisation attribute. WTP values are expressed in 2023 USD PPP and aggregated over a five-year period, consistent with the DCE valuation scenario. Aggregate values are obtained by converting monthly WTP estimates reported in Table 16 into total amounts over 60 months. Values may not exactly match those presented in Table 16 multiplied by 60 due to rounding. The cross-country average is calculated as the simple average of the country values.

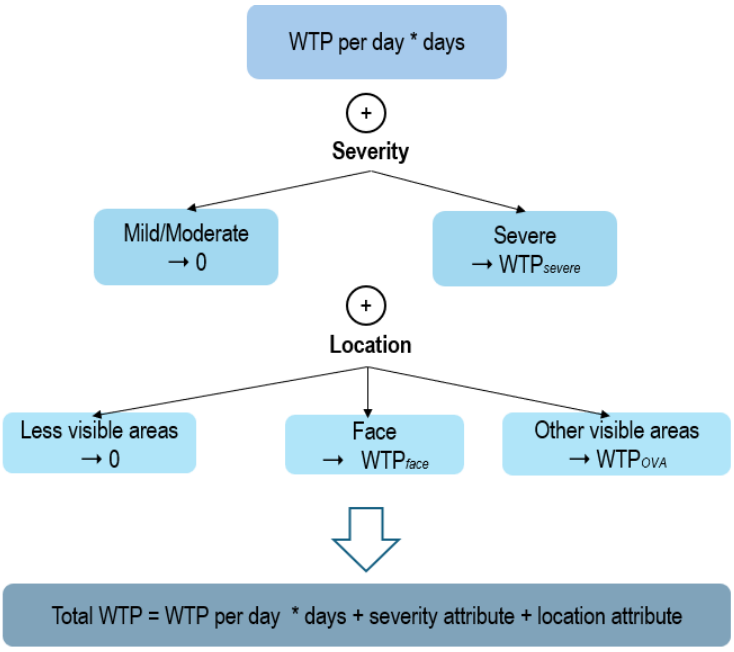
To illustrate a representative case drawing on the study data, nickel and nickel compounds are used as an example. Clinical evidence indicates that nickel is among the most prevalent skin sensitisers. A review by Ahlström et al. (2019[49]) estimates that the prevalence of nickel allergy in the general European population ranges from approximately 8% to 19% with a disproportionate impact on women (see also (Thyssen et al., 2007[34])). Although regulatory measures in some countries have sought to limit nickel use and exposure Ahlström et al. (2019[49]) highlight that nickel remains present in a wide range of everyday consumer and occupational items. These include jewelry and clothing as well as electronic devices and tools such as mobile phones, laptops, and workplace equipment.

For individuals sensitised to nickel or its compounds, subsequent exposure may trigger skin flare-ups although their duration varies and depends critically on the extent and timeliness of cessation of exposure to the sensitising substance. Clinical guidelines reviewed by Brasch et al. (2016) indicate that flare-up duration can range from three days to up to two weeks following cessation of exposure particularly in more severe acute or systemic cases.

With respect to the location of flare-ups Ahlström et al. (2019[49]) report that reactions are often localised to the site of contact with the sensitising substance but may also be more widespread. Common manifestations include hand eczema and exposure sites may extend to the face reflecting the presence of nickel in a range of everyday personal items such as jewellery, mobile, phones and other electronic devices.

To illustrate how the WTP values in this study can be applied a representative case profile is specified to estimate individuals' WTP to avoid a case of a skin flare-up arising from exposure to nickel (or its compounds). Figure 2 illustrates the steps involved in calculating a specific scenario for a defined case. The nickel-specific case is assumed to involve a severe flare-up lasting two weeks. Valuations are calculated for both visible and non-visible parts of the body using the results from Table 15 and 16 of this paper.

Figure 2. Scenario-specific estimates for skin sensitisation



Note: Scenario-specific estimates are constructed by aggregating attribute-level WTP/VSC estimates. For the sensitised sample, WTP estimates should be used, whereas for the non-sensitised sample, VSC estimates should be applied. The WTP/VSC to avoid one additional day of flare-up is multiplied by the total number of days considered. The severity and location attributes are added once per scenario. For scenarios with mild or moderate severity, no additional WTP/VSC is applied. Likewise, no additional WTP/VSC is added when the affected areas are less visible.

Case values are presented separately using WTP estimates derived from the sensitised and non-sensitised sub-samples. This distinction is policy-relevant as regulatory assessments may rely on estimates of the total number of expected cases associated with a proposed policy without necessarily knowing how these cases are distributed between individuals who are already sensitised and those who would otherwise become sensitised in the absence of regulation. The comparison therefore helps to illustrate the practical implications of applying alternative valuation assumptions in regulatory impact assessment. Where the distribution of sensitised and non-sensitised individuals in the affected population is not known, several plausible ranges of sensitisation prevalence could be tested, based on expert consultation (such as dermatologists, toxicologists…), to derive the corresponding values and conduct the associated cost-benefit analyses. This study also provides information, by country, on the share of respondents reporting being medically sensitised or not, which can serve as an approximation (see Table 5).

Table 20. Country-level values per expected case of nickel sensitisation (2-week severe flare-up)

	2-week severe flare-up on a non-visible area		2-week severe flare-up visible on the face		2-week severe flare-up visible on other areas	
	Sensitised (WTP)	Non-sensitised (VSC)	Sensitised (WTP)	Non-sensitised (VSC)	Sensitised (WTP)	Non-sensitised (VSC)
Canada	97	1 982	429	4 814	180	3 586
Denmark	93	2 090	418	4 521	175	3 690
Japan	312	1 980	660	4 715	394	3 594
Netherlands	214	2 337	550	5 136	297	3 965
Poland	182	1 722	505	4 422	265	3 309
Spain	205	2 202	527	4 738	289	3 753
Switzerland	229	2 064	566	4 788	312	3 611
United Kingdom	194	2 133	526	4 916	277	3 793
United States	195	1 912	542	4 441	278	3 652

Note: Values are expressed in 2023 USD PPP and assume a severe flare-up lasting 14 days. Case values are calculated based on Table 18 and Table 19 as: WTP/VSC per day of flare-up × 14 days + Severity of each flare-up + Location of flare-up. For the non-sensitised sample, values corresponding to avoiding a 10% risk of skin sensitisation attribute have been multiplied by 10 to represent the value of avoiding a 100% risk, thereby resulting in a value per statistical case (VSC). A case is defined here as a 2-week severe flare-up, either visible on the face, occurring on other areas, or non-visible. For the sensitised sample, values correspond to willingness to pay estimates (WTP) over 5 years to avoiding skin sensitisation. For example, flare-ups visible on the face in the UK sensitised sample: (USD 6.57 × 14) + USD 102.03 + USD 331.46 = USD 526 (rounded). For flare-ups on non-visible areas in the UK sensitised sample (USD 6.57 × 14 days) + USD 102.03 = USD 194 (rounded).

Table 20 reports estimated values per expected case of nickel sensitisation across the nine study countries distinguishing between sensitised and non-sensitised populations and by the visibility of flare-ups. Across all countries case values increase markedly with the visibility of symptoms with flare-ups on the face commanding the highest valuations followed by flare-ups on other visible body areas and the lowest values associated with non-visible locations. This pattern is observed consistently across both sensitised and non-sensitised samples underscoring the central role of visibility in shaping valuations of skin-sensitisation outcomes.

For non-visible flare-ups, estimated case values range from approximately USD 93–229 for sensitised individuals and USD 1 722–2 337 for non-sensitised individuals with values for the latter, therefore, generally substantially higher. When flare-ups are visible on the face case values increase substantially reaching between USD 418 and USD 660 for sensitised respondents and between USD 4 422 and USD 5 136 for non-sensitised respondents. Flare-ups affecting other visible areas of the body yield intermediate values typically around 1.6 times those associated with non-visible cases.

Cross-country variation is evident but generally modest relative to differences driven by symptom visibility and sensitisation status. Notable exceptions include Japan as well as Canada and Denmark. Japan exhibits particularly high valuations for visible flare-ups among sensitised individuals. In contrast the divergence observed for Canada and Denmark largely reflects the fact that the severity attribute was not statistically significant in the sensitised samples for these countries which lowers the resulting case values (see Section 5 and Table 15). Overall the results indicate that case severity and especially visibility are the primary determinants of per-case values while country-specific effects play a secondary role in explaining variation.

The per-case values derived in this study can be compared with existing estimates reported in the literature and reviewed in Section 1.2. For example, ECHA (2016[9]) value of statistical case estimates to avoid severe chronic dermatitis lasting for 2 weeks at USD_{2023} 1 410 and USD_{2023} 304 to prevent mild acute dermatitis also lasting for 2 weeks. That study further reports a mean WTP of USD_{2023} 478 to

prevent four cases of mild acute dermatitis within a single year increasing to USD$_{2023}$ 890 when the same four annual episodes are considered over a ten-year period. Similarly, HSE (2019[10]) drawing on a DCE study estimates mean WTP for severe rash requiring hospitalisation at USD$_{2023}$ PPP 213 in the United Kingdom and USD$_{2023}$ PPP 360 in the Netherlands compared with USD$_{2023}$ 207 PPP and USD$_{2023}$ 340 PPP respectively for mild rash without hospitalisation.

In general, the case values estimated in the present study (Table 20 and Table 21) are lower than these existing figures at least for the sensitised sample results. However, such comparisons should be interpreted with caution. Previous studies typically value somewhat different health endpoints or apply alternative definitions of what constitutes "mild" or "severe" cases. In several instances valuations also relate in part to the complete elimination of a condition rather than to reductions in frequency or severity of flareups at different visibility and location, as in the current analysis (see for example (Hauber et al., 2011[15])).

An important question is the divergence between the values for a standard case in the sensitised and non-sensitised samples. When scaling the results of the non-sensitised part of the sample to express the WTP as a certainty-equivalent value of an example case of nickel sensitisation, the value per case is close to 10 times higher than for the already sensitised sample. There are several possible explanations for this observation. First, it is possible that respondents are not very sensitive to the risk reduction, which could explain why the initial WTP values are similar between the sensitised and non-sensitised respondents. Second, it is also possible that non-sensitised participants have distinctly different preferences and also value the risk of becoming sensitised more than the flare-up itself (which they have yet to experience).[6]

Table 21. Pooled values per expected case of nickel sensitisation across location (2 weeks severe flare-up)

Values per case are expressed in 2023 USD PPP

	Location of each flare-up		
	Non-visible areas	Visible on the face	Other visible areas
Sensitised	191	525	274
Non-sensitised	2 047	4 721	3 652

Notes: Values are expressed in 2023 USD PPP. Data refer to pooled results across all study countries. Case values are computed following the approach in Table 20.

Table 21 presents pooled estimates of values per expected case of nickel sensitisation across the nine study countries differentiated by the location of flare-ups and sensitisation status. The results show a clear and consistent gradient by visibility. For both sensitised and non-sensitised populations case values are lowest when flare-ups occur on non-visible parts of the body and increase substantially when

[6] As an illustration, a direct utility model was estimated for the non-sensitised sample – in which risk enters as a distinct additive attribute. This substantially reduces this divergence (see Tables D.1 and D.2). However, it does not eliminate it. This suggests the gap reflects a combination of risk insensitivity and genuinely different underlying preferences rather than either explanation alone. Comparison of these two models suggests that risk insensitivity accounts for up to 60% of the divergence for an illustrative case which involves non-visible flare-up, and slightly higher insensitivity when the flare-up is visible. These estimates should be interpreted with caution, as a fuller decomposition of the two factors would be required. Additionally, any attribution is complicated by differences between the samples.

symptoms are visible particularly on the face. Across samples flare-ups visible on other body areas present intermediate values. Across locations estimated case values are broadly similar between sensitised and non-sensitised respondents with non-sensitised individuals reporting slightly higher valuations for non-visible and other visible flare-ups while sensitised individuals place higher values on facial flare-ups.

7 Conclusion

This study presents the results of a large-scale cross-country discrete choice experiment (DCE) to elicit willingness to pay (WTP) for avoiding skin sensitisation. While prior research has largely focused on condition-specific patient populations or relied on quality-of-life instruments, the present analysis addresses a key evidence gap by producing portable attribute-specific WTP estimates suitable for use in chemicals management policies at both national and international levels. A distinctive contribution of the study is its explicit differentiation between sensitised and non-sensitised populations, a dimension that has been largely under-explored in the valuation literature. The final survey instrument was implemented across nine countries: Canada, Denmark, Japan, the Netherlands, Poland, Spain, Switzerland, the United Kingdom, and the United States.

The results of the DCE confirm substantial disutility associated with skin sensitisation across all samples. While direct comparison with previous valuation studies is challenging, the estimates reported here appear relatively conservative in terms of absolute per-case values. Mixed logit models estimated in WTP space reveal substantial heterogeneity in valuations both across and more markedly within countries. The results further show that individuals attach significantly higher values to avoiding more severe outcomes and to preventing flare-ups occurring on visible parts of the body particularly the face compared with flare-ups located in less visible areas.

The inclusion of both sensitised and non-sensitised individuals is therefore a key strength of this study as it allows assessment of a potentially important source of heterogeneity in valuations. This design ensures that the analysis captures a broader societal perspective on skin sensitisation reflecting both ex-ante burdens associated with the risk of future sensitisation and ex-post burdens experienced by individuals already affected as a result of chemical exposure.

For the sensitised sample, estimated values can be interpreted as a WTP to avoid a unit change in specific attributes of a flare-up arising from skin sensitisation with certainty. The results indicate that while the frequency of a flare-up is relevant respondents place greater value on avoiding more severe cases and on preventing flare-ups that are visible to others particularly on the face. Findings for the non-sensitised sample are broadly consistent with this pattern notwithstanding that WTP estimates for this group relate to reductions in the risk of experiencing a flare-up rather than to avoidance of outcomes with certainty.

The implications of the findings are illustrated using the example of nickel sensitisation for which representative case values are derived based on an assumed two-week duration for a relatively severe flare-up. For flare-ups occurring on non-visible areas of the body sensitised individuals report lower but more dispersed valuations ranging from around USD 95 in Canada and Denmark to over USD 300 in Japan, while non-sensitised individuals report considerably higher but more tightly clustered values typically between USD 1 722 and USD 2 337 across countries. Averaged across the nine study countries pooled results indicate case values of USD 195 for sensitised individuals and USD 1 912 for non-sensitised individuals when flare-ups are not visible, with this divergence most plausibly divided between risk insensitivity and genuinely distinct preferences.

Visibility of symptoms substantially increases valuations in all countries and for both sensitised and non-sensitised groups. Using the same two-week example as above, facial flare-ups generate the highest

case values, averaging around USD 542 for sensitised individuals and USD 4 441 for non-sensitised individuals across countries—equivalent to around 2.5 times the value of non-visible cases for the sensitised sample and just over twice the value for the non-sensitised sample. Flareups affecting other visible body areas, such as hands are associated with intermediate values. This pronounced sensitivity to symptom visibility is consistent with earlier evidence highlighting the importance of location in health valuations (Hauber et al. 2011; Richard et al. 2023) and underscores the need for policy assessments of skin sensitisation to explicitly account for where symptoms manifest not only whether they occur.

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Annex A. SWACHE core principles

Detect potentially problematic responses

1. Generate a dummy variable for people failing the probability test
2. Speeder management: Generate one dummy variable for *survey* speeders and one dummy for *valuation* speeder. A respondent taking less than 48% of the median time is a speeder (ISS definition). Median values should be country specific to account for difference in languages that impact reading time.
3. Generate two dummies variable for distracted respondents: respondents who took an abnormally long time to respond:
   a. 48% longer than the median *survey* time,
   b. 48% longer than the median *valuation* time.
4. Optional. Generate a dummy variable for straightliners: when survey respondents give identical (or nearly identical) answers to items in a battery of questions using the same response scale. Note that there should not be any of them in the data sent by the internet panel provider.
5. Optional. Generate a dummy variable for respondents having incoherent answers:
   a. E.g., mismatch between the number of children, number of people in the household, or year of youngest child
6. Generate a dummy variable for unrealistic max WTP in open-ended question
7. Generate a dummy variable for probability test failers
8. Generate a dummy variable for protesters. This varies between endpoints. For example, in the asthma survey, people who disagree with the description of asthma provided in the survey or who are very doubtful that the information provided by the survey is correct or who thought they could just lower consumption of cleaning products can be considered as protesters.
9. Generate a dummy variable for respondents stating high co-benefits
10. Generate a dummy variable for consequentiality (real life debrief)
11. Optional. Read written responses to open ended questions to detect potentially problematic responses
12. Optional. Compute number of problematic responses to debriefing:
    a. that could overestimate WTP
    b. that could underestimate WTP
    c. that could go in either direction or a non-directional

Screen out problematic responses

- Baseline:
  - Exclude survey and valuation speeder (reinforced compared to Ipsos)
  - Exclude straightliners (already done by Ipsos)
  - Exclude respondents who fail the probability test (not applicable for IQ loss)
  - Keep pilot respondents if the survey design is the same even if parameters (such as bid levels) changed except if the changes are significant
  - Keep co-benefiters
  - Keep protesters to have a conservative estimate
  - Keep distracted respondents
  - Variations to perform as robustness checks:
- Optional robustness: stricter screening
  - Exclude survey and valuation speeder (same as option A)
  - Exclude straightliners (same as option A)
  - Exclude respondents who fail the probability test (same as option A)
  - Keep pilot respondents if the survey design is the same even if parameters (such as bid levels) changed (same as option A)
  - Keep co-benefiters (same as option A)
  - Exclude protesters because no does not mean true zero
  - Exclude distracted respondents
  - Exclude pilot respondents if pilot parameters differ too much (case of VLBW)
- Optional: exclude respondents that took more than 12h to complete the survey

Provide information on the sample of respondents

1. Compute summary statistics to describe the screened sample
   - Put main descriptive in body of text
   - And other e.g., country level in the appendix
2. Check that achieved quotas (age, education, location, gender) and income distribution in the screened sample are consistent with available population statistics (target quotas) at the country level (from OECD.stat and Eurostat).
3. For each country separately, compute post-stratification weights to reweight later the observations through an iterative proportional fitting procedure (raking algorithm) using the following strata:
   - Gender × Age: (1) males aged 18-24; (2) males aged 25-34; (3) males aged 35-39; (4) males aged 40-44; (5) males aged 45-65; (6) females aged 18-24; (7) females aged 25-34; (8) females aged 35-39; (9) females aged 40-44.
   - Educational level: (1) low, (2) medium, and (3) high
   - Geographic region: country-specific NUTS 2 regions

1. It is important to consider the efficiency of the weights, such that ideally the overall weighting efficiency remains above a certain value to avoid any significant impact on the effective sample sizes obtained and, consequently, on the statistical power of the analyses conducted. Weighting efficiency can be further improved by collapsing weighting cells and capping weights at each of the steps to reduce the impact on the variance of the final weights. At the end of each iteration of the algorithm, any weights larger than 3.0 or lower than 1/3 should be automatically set to equal this cap.

Analyse responses to the valuation questions after baseline screening

1. Compute the DBDC response matrix for both the pooled dataset and each country of the dataset
2. Scope analysis:
   - Verify that the share of yes response decreases with the cost to be paid
   - Verify that the share of yes response increases with the risk reduction offered
3. Analyse written (open-ended) questions:
   - Use examples to illustrate the thinking of respondents if they were asked why they made their choice
   - Optional. Check consistency between OE and DBDC responses
4. As a preliminary step, regress SBDC (response to first dichotomous choice) on income, bid amount, baseline risk (if relevant) and risk reduction using a logit model
5. Optional. Try to find determinants of no-no and yes-yes responses using responses to debriefing questions

Compute harmonised variables

1. Compute continuous income level in USD PPP[7] based on unequivalised income range selected by the respondents:
   - Average of each interval
   - 0.5 lowest interval and 1.5 highest interval
2. Predict missing income using the following strategy
   - Generate the following dummies
     - Missing income dummy equal to 1 if the respondent did not provide income information
     - Couple dummy equals 1 if the respondent is married or have a partner
     - Employed dummy equals 1 if the respondent is in one of the following situations:
       - employed full-time
       - self employed

[7] This is OECD standard. PPS is the technical term used by Eurostat for the common currency in which national accounts aggregates are expressed when adjusted for price level differences using PPPs. Thus, PPPs can be interpreted as the exchange rate of the PPS against the euro.

- military
- Own business manager

– Part time dummy equals 1 if the respondent is employed part time

– Retired dummy equals 1 if the respondent is retired

– Replace employed and part time dummies by 0 if they are missing

– Replace retired dummy by 1 if it is missing and the person is aged 60 or more or by 0 if it is missing and the person is younger than 60 years old.

- For each surveyed country separately, run the OLS regression of log(income) on age dummies, high education dummy, female dummy, couple dummy, number of persons in the household, employed dummy, part time dummy and retired dummy. For surveys targeting couples planning to have children, do not include couple dummy nor retired dummy that are naturally omitted since perfectly colinear.
- Predict income based on the regressions
- Replace missing income with predicted value in the main dataset

3. Compute a variable for age:
   - Option A (preferred). One dummy variable for each category ➔ better identification
   - Option B. Continuous age as for income ➔ preserves statistical power
     – 18-26 ➔22
     – 27-34 ➔ 30.5
     – 35-39 ➔37
     – 40-44 ➔ 42
     – 45-65 ➔ 55
     – 65+ ➔ 70
4. Compute a variable for education using Ipsos's low, medium and high category (directly available)
5. For all countries except the United States, compute bid level in USD PPP equivalent using OECD data on PPP for actual individual consumption. Because of rounding after currency conversion, respondents in non-US countries had bid levels that are slightly different than the bid levels seen by US respondents. Reconverting actual bid levels to USD PPP equivalent allows to obtain a more precise bid amount.

Apply a standard specification

1. Baseline:
   - All surveys: intercept, female, age, kids02, category dummies, log(income), missing income dummy, low, medium, high education dummies, baseline risk (if relevant), risk reduction
   - Add country dummies interacted by the post stratification weights to account for the difference between target and achieved sample quotas. This is similar to—albeit less complex than—the correction method for choice-based samples proposed by (Manski and Lerman, 1977[50]). Do not add country dummies to these interactions to avoid multi collinearity.

- Add the number of children for infertility and VLBW

2. Robustness checks:
   - Health augmentation: own health perception, know someone having the condition, lifestyle, covid
   - Run the estimation without the missing income dummy.

Estimate average and median WTP based on DBDC

1. Estimator: DBDC or SBDC:
   - Baseline: interval-data maximum likelihood estimator using DBDC
   - Robustness check: Estimate WTP based on SB choice with logit model to compare to DB estimate
2. Distribution of the error:
   - Baseline (preferred to allow comparison across endpoints): Weibull. The Weibull distribution has desirable characteristics. Specifically, this specification offers a flexible survival function which mimics other distributional forms quite well, and thanks to its shorter right tail it typically performs better than the log-normal distribution (Carson and Hanneman, 2005[51]).
   - Robustness checks:
     - Non-parametric: Turnbull (e.g., Kaplan-Meier)
     - Basic parametric: normal, log normal, logistic, log logistic
     - Identify estimator with the lowest Akaike information criterion ($AIC = 2k - 2\ln\hat{L}$)
3. Spike configuration:
   - Baseline: use spike configuration (Kriström, 1997[52]; Carson and Hanneman, 2005[51]) if the spike variable is higher or equal to 5%. In other words, use spike when the average probability that people are indifferent to the valued item is higher or equal to 5%. Spike configuration can still be used if spike is lower than 5% but close to it. Spike is less likely to be relevant when people that have a priori no preference for the good are screened out by design. This is the case of the infertility and VLBW where only people planning to have a child over the next years were able to respond to the survey.
   - Robustness check: Compare estimates using spike and without using spike.
4. Compute WTP and VSC on pooled dataset based on a simple model with constant, country dummies interacted with weights and risk reduction as the only covariates using the following formulas:
   - Baseline: $\widehat{VSC} = \frac{1}{n}\sum_i \widehat{VSC_i}$ where $\widehat{VSC_i} = \widehat{WTP_i}/RR_i$ and $\widehat{WTP_i}$ is the individual mean WTP (truncated at the maximum bid with adjustment)
   - Robustness check (optional): Compute average WTP at sample mean: $\overline{\widehat{WTP}} = \widehat{b_0} + \widehat{b_1}\overline{RR}$ ➔ $\widehat{VSC} = \overline{\widehat{WTP}}/\overline{RR}$
5. Compute WTP and VSC for each country based on the ***pooled*** regression estimated above. Do not use separate country-level regressions to generate country-level WTP and VSC as indicated in the previous version. Using the

pooled model allows to capture the “cultural” differences between the countries (by also taking into account the fact that the sample is not perfectly representing the population in the country), by multiplying the country dummies with the weights, and using this as a coefficient to predict the values in each country. The pooled approach also increases dramatically the statistical power.

6. Perform the estimation using the standard specification defined above to test determinants of WTP:
   - Assess scope sensitivity:
     - Inference of the risk reduction coefficient
     - Optional. Estimate WTP for different risk reduction separately
   - Estimate income elasticity by simulating an increase in income by 1% for all respondents.
     - Increase income of all respondents by 1% before computing individual WTP. This relies on the same estimates derived from original data.
     - Compute the new mean of the individual mean WTP (truncated at the maximum bid with adjustment)
     - The elasticity is equal to this % change between this new mean and the baseline mean WTP.
   - Other effects using the regressors of the specification: age, gender, etc.

Derive central value and range of VSC for pooled dataset and each country

1. Estimate central value (mean VSC) using the baseline approach. The central value should be clearly identified for regulators to choose.
2. Clearly present country-specific values as recommended values because they can be directly use in cost benefit analyses.
3. Provide pooled (all countries) mean VSC for information.
4. Provide pooled and country specific median WTP and VSC in the appendix
5. Provide an example of how the VSC can be used in CBA.
6. Compare WTP and VSC with magnitude of available WTP, QALY and Cost of Illness estimates from the literature for similar endpoints.

Prepare and share your code

1. Baseline: Prepare your code in R because it is free and more flexible (see dbchoice and dbspike packages). In contrast, only interval data ML estimators based on normal distribution are directly available for Stata (intreg, doubleb). In the long run, it is planned to make the code of the working paper publicly available.
2. Comment your code sufficiently so that a third person can run your code from scratch.
3. Share your code in shared folders.

Annex B. Results in local currencies

Table A.1. Country-level monthly willingness to pay to avoid skin sensitisation attribute among the sensitised sample (local currency)

Results are expressed in local currency 2023

	WTP to avoid one extra day of flare-up	Severity of each flare-up	Location of each flare-up	
			Visible in face	Other visible areas
		WTP to avoid one extra severe case	WTP to avoid case being visible in face	WTP to avoid case being in other visible areas
Canada	CAD 0.133	CAD 0.66	CAD 6.33	CAD 1.58
Denmark	DKK 0.721	DKK 5.66	DKK 35.57	DKK 9.04
Japan	JPY 12	JPY 305	JPY 530	JPY 125
Netherlands	EUR 0.082	EUR 1.47	EUR 4.11	EUR 1.02
Poland	PLN 0.180	PLN 2.73	PLN 9.30	PLN 2.39
Spain	EUR 0.060	EUR 1.11	EUR 3.06	EUR 0.79
Switzerland	CHF 0.111	CHF 2.65	CHF 6.21	CHF 1.52
United Kingdom	GBP 0.076	GBP 1.18	GBP 3.82	GBP 0.96
United States	USD 0.107	USD 1.66	USD 5.61	USD 1.34

Table A.2. Country-level monthly willingness to pay to avoid the risk of skin sensitisation attribute among the non-sensitised sample (local currency)

Results are expressed in local currency 2023. For the non-sensitised sample, willingness-to-pay estimates refer to avoiding a 10 % risk of skin sensitisation attribute.

	WTP to avoid one extra day of flare-up	Severity of each flare-up	Location of each flare-up	
			Visible in face	Other visible areas
		WTP to avoid one extra severe case	WTP to avoid case being visible in face	WTP to avoid case being in other visible areas
Canada	CAD 0.171	CAD 1.39	CAD 5.41	CAD 3.06
Denmark	DKK 0.970	DKK 9.24	DKK 26.53	DKK 17.49
Japan	JPY 13	JPY 118	JPY 417	JPY 246
Netherlands	EUR 0.124	EUR 1.13	EUR 3.42	EUR 1.99
Poland	PLN 0.235	PLN 1.66	PLN 7.78	PLN 4.58
Spain	EUR 0.087	EUR 0.88	EUR 2.41	EUR 1.48
Switzerland	CHF 0.164	CHF 1.50	CHF 5.01	CHF 2.85
United Kingdom	GBP 0.105	GBP 0.99	GBP 3.21	GBP 1.92
United States	USA 0.142	USA 1.11	USA 4.09	USA 2.66

Annex C. Additional descriptive statistics

Table B.1. Distribution of participants within each study country

(a) Canada

Region	Frequency	Percent
Alberta	143	11.7
British Columbia	167	13.7
Manitoba	44	3.6
New Brunswick	26	2.1
Newfoundland and Labrador	17	1.4
Northwest Territories	1	0.1
Nova Scotia	32	2.6
Nunavut	1	0.1
Ontario	475	38.9
Prince Edward Island	3	0.2
Quebec	271	22.2
Saskatchewan	38	3.1
Yukon	2	0.2
Total	**1 220**	**100.0**

(b) Denmark

Region	Frequency	Percent
Hovedstaden	376	30.9
Midtjylland	278	22.9
Nordjylland	121	10.0
Sjælland	183	15.1
Syddanmark	257	21.2
Total	**1 215**	**100.0**

(c) Japan

Region	Frequency	Percent
Chubu	190	15.6
Chugoku	76	6.3
Hokkaido	56	4.6
Kansai	223	18.4
Kanto	460	37.9
Kyushu / Okinawa	102	8.4
Shikoku	33	2.7
Tohoku	75	6.2
Total	**1 215**	**100.0**

(d) The Netherlands

Region	Frequency	Percent
Drenthe	36	3.0
Flevoland	29	2.4
Friesland	46	3.8
Gelderland	148	12.2
Groningen	43	3.5
Limburg	84	6.9
Noord-Brabant	180	14.8
Noord-Holland	190	15.6
Overijssel	83	6.8
Utrecht	90	7.4
Zeeland	29	2.4
Zuid-Holland	259	21.3
Total	**1 217**	**100.0**

(e) Poland

Region	Frequency	Percent
Dolnośląskie	95	7.8
Kujawsko-Pomorskie	65	5.3
Lubelskie	65	5.3
Lubuskie	29	2.4
Łódzkie	79	6.5
Małopolskie	109	9.0
Mazowieckie	179	14.7
Opolskie	29	2.4
Podkarpackie	65	5.3
Podlaskie	37	3.0
Pomorskie	75	6.2
Śląskie	143	11.8
Świętokrzyskie	38	3.1
Warmińsko-Mazurskie	42	3.5
Wielkopolskie	113	9.3
Zachodniopomorskie	54	4.4
Total	**1 217**	**100.0**

(f) Spain

Region	Frequency	Percent
Andalucía	216	17.7
Aragón	35	2.9
Canarias	58	4.8
Cantabria	16	1.3
Castilla y León	64	5.2
Castilla-La Mancha	52	4.3
Cataluña	200	16.4
Ciudad Autónoma de Ceuta	1	0.1
Ciudad Autónoma de Melilla	2	0.2
Comunidad Foral de Navarra	10	0.8
Comunidad Valenciana	133	10.9
Comunidad de Madrid	174	14.3

Extremadura	28	2.3
Galicia	72	5.9
Islas Baleares	26	2.1
La Rioja	9	0.7
País Vasco	57	4.7
Principado de Asturias	28	2.3
Región de Murcia	39	3.2
Total	**1 220**	**100.0**

(g) Switzerland

Region	Frequency	Percent
Espace Mittelland	270	22.4
Nordwestschweiz	170	14.1
Ostschweiz	164	13.6
Région lémanique	239	19.9
Ticino	47	3.9
Zentralschweiz	96	8.0
Zürich	218	18.1
Total	**1 204**	**100.0**

(h) United Kingdom

Region	Frequency	Percent
East Midlands	88	7.2
East of England	114	9.4
Greater London	161	13.2
North East	49	4.0
North West	134	11.0
Northern Ireland	33	2.7
Scotland	103	8.5
South East	167	13.7
South West	105	8.6
Wales	58	4.8
West Midlands	107	8.8
Yorkshire and Humberside	99	8.1
Total	**1 218**	**100.0**

(i) United States

Region	Frequency	Percent
East North Central	174	14.3
East South Central	70	5.7
Middle Atlantic	156	12.8
Mountain	86	7.1
New England	57	4.7
Pacific	201	16.5
South Atlantic	244	20.0
West North Central	78	6.4
West South Central	152	12.5
Total	**1 218**	**100.0**

Table B.2. Skin sensitisation and health variables by country

	All		Canada		Denmark		Japan		Netherlands		Poland		Spain		Switzerland		United Kingdom		United States	
	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd
Sensitised (self-reported)	0.62	0.48	0.64	0.48	0.66	0.47	0.62	0.49	0.64	0.48	0.66	0.47	0.63	0.48	0.62	0.48	0.59	0.49	0.56	0.50
Family sensitised	0.11	0.31	0.11	0.32	0.11	0.32	0.05	0.22	0.11	0.31	0.09	0.29	0.12	0.33	0.13	0.33	0.12	0.32	0.11	0.31
Diagnosed	0.33	0.47	0.33	0.47	0.36	0.48	0.32	0.47	0.38	0.49	0.28	0.45	0.35	0.48	0.34	0.47	0.31	0.46	0.31	0.46
Severity (own reaction)	2.71	0.92	2.70	0.94	2.83	0.94	2.28	0.87	2.75	0.97	2.98	0.87	2.60	0.81	2.77	0.93	2.73	0.90	2.69	0.93
Frequency of reactions (own)	1.93	1.65	1.76	1.59	1.91	1.63	2.41	1.81	1.96	1.75	2.04	1.51	1.76	1.66	1.65	1.60	2.01	1.64	1.87	1.58
Typical reaction on face	0.24	0.42	0.21	0.41	0.28	0.45	0.20	0.40	0.22	0.41	0.24	0.43	0.29	0.45	0.24	0.43	0.23	0.42	0.21	0.41
Typical reaction on visible areas	0.34	0.48	0.41	0.49	0.32	0.46	0.39	0.49	0.35	0.48	0.35	0.48	0.32	0.46	0.31	0.46	0.31	0.46	0.34	0.47
Typical reaction on less visible areas	0.18	0.38	0.17	0.38	0.18	0.39	0.21	0.41	0.23	0.42	0.19	0.39	0.17	0.37	0.18	0.39	0.17	0.38	0.12	0.32
Own health status	3.60	0.84	3.80	0.80	3.52	0.89	3.21	0.81	3.59	0.80	3.41	0.90	3.75	0.71	3.64	0.87	3.66	0.82	3.82	0.76
Relative health status	3.26	0.87	3.38	0.89	3.17	0.89	3.04	0.80	3.27	0.87	3.21	0.86	3.27	0.83	3.23	0.86	3.33	0.90	3.48	0.89
Exposed to chemicals (work)	0.14	0.34	0.14	0.34	0.13	0.33	0.09	0.28	0.14	0.35	0.17	0.38	0.14	0.35	0.16	0.37	0.14	0.35	0.13	0.34
Perceived risk	2.38	1.02	2.30	1.02	2.40	0.94	2.47	0.98	2.40	1.08	2.41	1.10	2.43	1.04	2.38	1.04	2.37	0.97	2.30	1.03
Observations	**10 944**		**1 220**		**1 215**		**1 215**		**1 217**		**1 217**		**1 220**		**1 204**		**1 218**		**1 218**	

Note: Values are presented as mean (standard deviation). Percentages and scales are in their original units. Severity and Frequency scales: Higher values indicate greater severity or frequency. Own health, relative health and perceived risk scales: Higher values indicate better health or higher perceived risk.

Table B.3. Reported diagnosed health conditions by country (%)

Condition	All		Canada		Denmark		Japan		Netherlands		Poland		Spain		Switzerland		United Kingdom		United States	
	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd
Kidney disease	0.02	0.15	0.02	0.13	0.03	0.18	0.02	0.13	0.01	0.10	0.04	0.19	0.02	0.14	0.03	0.17	0.02	0.13	0.02	0.15
Heart disease	0.06	0.24	0.05	0.22	0.08	0.26	0.01	0.12	0.07	0.26	0.10	0.31	0.04	0.20	0.07	0.26	0.04	0.21	0.06	0.24
Obesity	0.09	0.29	0.09	0.29	0.10	0.30	0.04	0.19	0.07	0.26	0.14	0.35	0.11	0.31	0.09	0.29	0.07	0.25	0.12	0.32
Diabetes	0.09	0.29	0.11	0.31	0.08	0.28	0.04	0.19	0.10	0.29	0.11	0.32	0.09	0.29	0.07	0.25	0.09	0.28	0.12	0.32
Parkinson's	0.01	0.08	0.00	0.06	0.01	0.10	0.00	0.04	0.00	0.07	0.01	0.09	0.01	0.08	0.01	0.10	0.01	0.09	0.01	0.09
Alzheimer's/ Dementia	0.01	0.08	0.00	0.07	0.01	0.10	0.00	0.04	0.00	0.05	0.00	0.07	0.01	0.08	0.01	0.08	0.00	0.05	0.02	0.13
Arthritis	0.09	0.28	0.10	0.30	0.13	0.33	0.02	0.15	0.09	0.29	0.09	0.29	0.10	0.30	0.07	0.25	0.10	0.30	0.08	0.28
Respiratory Issues	0.07	0.26	0.08	0.27	0.10	0.30	0.04	0.20	0.09	0.28	0.07	0.25	0.07	0.25	0.06	0.23	0.09	0.29	0.08	0.27
Other	0.12	0.32	0.12	0.32	0.16	0.37	0.10	0.31	0.15	0.36	0.14	0.34	0.11	0.31	0.12	0.32	0.10	0.29	0.09	0.28
None	0.59	0.49	0.60	0.49	0.50	0.50	0.73	0.44	0.57	0.50	0.50	0.50	0.56	0.50	0.60	0.49	0.62	0.49	0.59	0.49
Observations	**10 944**		**1 220**		**1 215**		**1 215**		**1 217**		**1 217**		**1 220**		**1 204**		**1 218**		**1 218**	

Note: Answers to the question: “Check all the chronic diseases and conditions that you have (those that bother you over many months or years) according to doctor diagnoses”. Values are presented as percentages and may sum to more than 100% as participants could report multiple conditions.

Table B.4. Perceived risk distribution by country

Risk	Canada		Denmark		Japan		Netherlands		Poland		Spain		Switzerland		United Kingdom		United States	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
I don't know	105	12.1	93	11.0	146	16.9	98	11.9	145	15.8	115	13.9	63	7.3	97	10.6	85	9.4
I prefer not to answer	8	0.9	9	1.1	17	2.0	5	0.6	12	1.3	8	1.0	9	1.0	6	0.7	10	1.1
My risk is clearly larger	14	1.6	16	1.9	16	1.9	22	2.7	33	3.6	16	1.9	22	2.6	16	1.8	22	2.4
My risk is clearly lower	209	24.0	134	15.9	129	15.0	188	22.9	207	22.6	168	20.3	187	21.7	179	19.6	220	24.4

My risk is just about average	267	30.7	277	32.8	271	31.4	246	30.0	299	32.7	273	33.0	261	30.3	321	35.1	282	31.3
My risk is somewhat larger	62	7.1	53	6.3	68	7.9	80	9.7	60	6.6	75	9.1	81	9.4	56	6.1	58	6.4
My risk is somewhat lower	205	23.6	262	31.0	215	24.9	182	22.2	159	17.4	172	20.8	239	27.7	239	26.1	223	24.8
Total	**870**	**100.0**	**844**	**100.0**	**862**	**100.0**	**821**	**100.0**	**915**	**100.0**	**827**	**100.0**	**862**	**100.0**	**914**	**100.0**	**900**	**100.0**

Note: Answers to the question: "How do you rate your risk of getting skin sensitised compared to the average person living in your country?". Percentages are calculated within each country. Totals may not sum to 100% due to rounding.

Table B.5. Sensitisation experiences and choice determinants by country

Category	Canada		Denmark		Japan		Netherlands		Poland		Spain		Switzerland		United Kingdom		United States		Total	
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
DIFFICULTY IN ANSWERING																				
"Please give us some feedback on how you found making the previous 6 choices. How difficult was it to answer these 6 questions?"																				
Fairly difficult	396	32.5	469	38.6	681	56.0	487	40.0	432	35.5	335	27.5	449	37.3	389	31.9	275	22.6	3 913	35.8
Not at all difficult	198	16.2	152	12.5	68	5.6	185	15.2	211	17.3	287	23.5	170	14.1	244	20.0	304	25.0	1 819	16.6
Not very difficult	560	45.9	490	40.3	239	19.7	482	39.6	527	43.3	537	44.0	515	42.8	545	44.7	591	48.5	4 486	41.0
Very difficult	66	5.4	104	8.6	227	18.7	63	5.2	47	3.9	61	5.0	70	5.8	40	3.3	48	3.9	726	6.6
Total	**1 220**	**100.0**	**1 215**	**100.0**	**1 215**	**100.0**	**1 217**	**100.0**	**1 217**	**100.0**	**1 220**	**100.0**	**1 204**	**100.0**	**1 218**	**100.0**	**1 218**	**100.0**	**10 944**	**100.0**
FOCUS WHILE ANSWERING																				
"When making your choices about reducing skin sensitisation risk, severity and frequency, were you focusing on your own situation or did you also consider the situation of other members of your household?"																				
Considered my situation and my household situation	234	19.2	230	18.9	290	23.9	213	17.5	312	25.6	357	29.3	224	18.6	293	24.1	309	25.4	2 462	22.5
Focused on own situation	986	80.8	985	81.1	925	76.1	1 004	82.5	905	74.4	863	70.7	980	81.4	925	75.9	909	74.6	8 482	77.5
Total	**1 220**	**100.0**	**1 215**	**100.0**	**1 215**	**100.0**	**1 217**	**100.0**	**1 217**	**100.0**	**1 220**	**100.0**	**1 204**	**100.0**	**1 218**	**100.0**	**1 218**	**100.0**	**10 944**	**100.0**
FACTORS INFLUENCING CHOICE																				
"When making your choices, which characteristics influenced your choices? Select all that apply"																				
Frequency influenced choice	79	22.6	97	26.1	95	26.9	104	26.3	85	28.1	88	22.4	84	24.6	92	30.3	89	28.0	813	26.0
Location influenced choice	71	20.3	92	24.8	109	30.9	110	27.8	92	30.5	92	23.4	104	30.4	73	24.0	79	24.8	822	26.3
Severity influenced choice	97	27.7	77	20.8	115	32.6	136	34.3	66	21.9	108	27.5	101	29.5	71	23.4	91	28.6	862	27.5
Expenditure influenced choice	81	23.1	123	33.2	132	37.4	140	35.4	68	22.5	93	23.7	94	27.5	70	23.0	76	23.9	877	28.0

All reasons influenced choice	177	50.6	139	37.5	114	32.3	145	36.6	126	41.7	169	43.0	127	37.1	136	44.7	147	46.2	1 280	40.9
No reason influenced choice	8	2.3	9	2.4	21	5.9	15	3.8	4	1.3	7	1.8	7	2.0	8	2.6	2	0.6	81	2.6
FREQUENCY CONSIDERATIONS																				
"Why did the "frequency of flare-ups" not influence your choices? Select all that apply."																				
Frequency was not important	32	34.0	43	31.9	35	24.3	48	32.7	26	28.6	45	33.1	53	40.5	28	36.8	30	36.6	340	32.8
Frequency not considered: Forgot	18	19.1	26	19.3	17	11.8	27	18.4	22	24.2	24	17.6	26	19.8	8	10.5	22	26.8	190	18.3
Frequency not considered: too many others	38	40.4	48	35.6	91	63.2	57	38.8	42	46.2	64	47.1	50	38.2	29	38.2	27	32.9	446	43.1
Frequency not considered: other reason	11	11.7	24	17.8	6	4.2	21	14.3	3	3.3	10	7.4	10	7.6	14	18.4	9	11.0	108	10.4
STATUS QUO REASONS																				
"In the previous choices you always chose the "current situation". Why? Select all that apply"																				
Status quo: poor understanding	2	7.1	0	0.0	6	11.1	2	5.7	3	8.3	2	3.3	1	2.6	2	6.5	0	0.0	18	5.3
Status quo: too many options	3	10.7	5	14.7	17	31.5	8	22.9	10	27.8	17	28.3	6	15.4	7	22.6	4	16.7	77	22.6
Status quo: cost/reduction too high	11	39.3	8	23.5	9	16.7	12	34.3	9	25.0	24	40.0	12	30.8	6	19.4	4	16.7	95	27.9
Status quo: tight budget	15	53.6	17	50.0	20	37.0	11	31.4	15	41.7	19	31.7	18	46.2	17	54.8	13	54.2	145	42.5
Status quo: not worried	6	21.4	1	2.9	10	18.5	9	25.7	2	5.6	5	8.3	2	5.1	2	6.5	2	8.3	39	11.4
Status quo: no credible changes	4	14.3	9	26.5	9	16.7	3	8.6	11	30.6	10	16.7	5	12.8	7	22.6	5	20.8	63	18.5
Status quo: other reason	2	7.1	4	11.8	2	3.7	2	5.7	0	0.0	6	10.0	6	15.4	1	3.2	3	12.5	26	7.6

Note: Values are presented as mean or percentages. Ease of choice scale: Higher values indicate greater ease (on a 1-4 scale). Percentages for reasons may not sum to more than 100% as multiple responses were allowed.

Table B.6. Experiences and choice determinants by country among the non-sensitised sample

Category	Canada		Denmark		Japan		Netherlands		Poland		Spain		Switzerland		United Kingdom		United States		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
DIFFICULTY IN ANSWERING																				
"Please give us some feedback on how you found making the previous 6 choices. How difficult was it to answer these 6 questions?"																				
Fairly difficult	396	32.5	469	38.6	681	56.0	487	40.0	432	35.5	335	27.5	449	37.3	389	31.9	275	22.6	3 913	35.8
Not at all difficult	198	16.2	152	12.5	68	5.6	185	15.2	211	17.3	287	23.5	170	14.1	244	20.0	304	25.0	1 819	16.6
Not very difficult	560	45.9	490	40.3	239	19.7	482	39.6	527	43.3	537	44.0	515	42.8	545	44.7	591	48.5	4 486	41.0
Very difficult	66	5.4	104	8.6	227	18.7	63	5.2	47	3.9	61	5.0	70	5.8	40	3.3	48	3.9	726	6.6
Total	**1 220**	**100.0**	**1 215**	**100.0**	**1 215**	**100.0**	**1 217**	**100.0**	**1 217**	**100.0**	**1 220**	**100.0**	**1 204**	**100.0**	**1 218**	**100.0**	**1 218**	**100.0**	**10 944**	**100.0**
FOCUS WHILE ANSWERING																				
"When making your choices about reducing skin sensitisation risk, severity and frequency, were you focusing on your own situation or did you also consider the situation of other members of your household?"																				
Considered my situation and my household situation	234	19.2	230	18.9	290	23.9	213	17.5	312	25.6	357	29.3	224	18.6	293	24.1	309	25.4	2 462	22.5
Focused on own situation	986	80.8	985	81.1	925	76.1	1 004	82.5	905	74.4	863	70.7	980	81.4	925	75.9	909	74.6	8 482	77.5
Total	**1 220**	**100.0**	**1 215**	**100.0**	**1 215**	**100.0**	**1 217**	**100.0**	**1 217**	**100.0**	**1 220**	**100.0**	**1 204**	**100.0**	**1 218**	**100.0**	**1 218**	**100.0**	**10 944**	**100.0**
FACTORS INFLUENCING CHOICE																				
"When making your choices, which characteristics influenced your choices? Select all that apply"																				
NS Risk influence choice	167	19.2	174	20.6	195	22.6	176	21.4	220	24.0	160	19.3	182	21.1	157	17.2	165	18.3	1 596	20.4
NS Frequency influenced choice	220	25.3	239	28.3	220	25.5	216	26.3	252	27.5	189	22.9	230	26.7	261	28.6	233	25.9	2 060	26.4
NS Location influenced choice	188	21.6	199	23.6	218	25.3	207	25.2	234	25.6	186	22.5	245	28.4	235	25.7	224	24.9	1 936	24.8
NS Severity influenced choice	217	24.9	186	22.0	233	27.0	258	31.4	156	17.0	246	29.7	209	24.2	236	25.8	230	25.6	1 971	25.2
NS Expenditure influenced choice	229	26.3	296	35.1	378	43.9	304	37.0	266	29.1	201	24.3	269	31.2	319	34.9	237	26.3	2 499	32.0
NS All reasons influenced choice	365	42.0	211	25.0	156	18.1	227	27.6	270	29.5	271	32.8	220	25.5	326	35.7	335	37.2	2 381	30.5
NS No reason influenced choice	48	5.5	69	8.2	99	11.5	47	5.7	64	7.0	49	5.9	55	6.4	32	3.5	59	6.6	522	6.7
FREQUENCY CONSIDERATIONS																				

"Why did the "frequency of flare-ups" not influence your choices? Select all that apply."																				
NS Frequency was not important	112	39.3	133	33.8	141	29.0	163	43.1	137	34.9	102	27.8	164	39.8	133	40.7	145	43.7	1 230	36.5
NS Frequency not considered: Forgot	50	17.5	82	20.8	101	20.8	77	20.4	74	18.8	85	23.2	100	24.3	58	17.7	56	16.9	683	20.2
NS Frequency not considered: too many others	114	40.0	171	43.4	257	52.9	128	33.9	179	45.5	166	45.2	138	33.5	123	37.6	123	37.0	1 399	41.5
NS Frequency not considered: other reason	22	7.7	26	6.6	4	0.8	23	6.1	19	4.8	18	4.9	19	4.6	28	8.6	23	6.9	182	5.4
STATUS QUO REASONS																				
"In the previous choices you always chose the "current situation". Why? Select all that apply"																				
NS Status quo: poor understanding	8	9.9	9	10.0	47	31.3	8	11.4	17	9.8	5	4.5	12	11.8	8	7.8	6	6.1	120	12.3
NS Status quo: too many options	20	24.7	25	27.8	45	30.0	16	22.9	34	19.5	21	19.1	19	18.6	13	12.7	9	9.1	202	20.7
NS Status quo: cost/reduction too high	24	29.6	20	22.2	13	8.7	19	27.1	42	24.1	41	37.3	23	22.5	35	34.3	36	36.4	253	25.9
NS Status quo: tight budget	36	44.4	38	42.2	51	34.0	26	37.1	67	38.5	37	33.6	38	37.3	42	41.2	45	45.5	380	38.9
NS Status quo: no pay for risk	19	23.5	20	22.2	6	4.0	21	30.0	32	18.4	32	29.1	23	22.5	22	21.6	23	23.2	198	20.2
NS Status quo: not worried	14	17.3	20	22.2	21	14.0	7	10.0	20	11.5	13	11.8	21	20.6	21	20.6	20	20.2	157	16.1
NS Status quo: no credible risk red	8	9.9	7	7.8	11	7.3	8	11.4	27	15.5	8	7.3	18	17.6	11	10.8	10	10.1	108	11.0
NS Status quo: no credible changes	14	17.3	10	11.1	21	14.0	8	11.4	31	17.8	18	16.4	15	14.7	13	12.7	15	15.2	145	14.8
NS Status quo: other reason	2	2.5	2	2.2	3	2.0	3	4.3	10	5.7	5	4.5	3	2.9	2	2.0	4	4.0	34	3.5

Note: Values are presented as mean or percentages. Ease of choice scale: Higher values indicate greater ease (on a 1-4 scale). Percentages for reasons may not sum to more than 100% as multiple responses were allowed.

Annex D. Direct Utility model among the non-sensitised sample

The analysis underlying the results presented in Table D.1 follows the approach outlined in Section 3.2 namely a Random Utility Model (RUM) framework, with estimation carried out using a mixed logit (random parameters logit) specification. The analysis followed the same procedures described in Section 3.2 for the sensitised sample. The principal difference is that, for the non-sensitised sample, the risk of a skin flare-up was included as an additional attribute. In the direct utility specification, this implies that the risk attribute contributes independently to utility. In other words, respondents are assumed to derive (dis)utility directly from risk itself, irrespective of its role in affecting the likelihood of a flare-up characterised by a given duration, severity or visibility.

Given this assumption, the deterministic component of utility is specified as follows:

$$V = \alpha_1 \,\mathrm{ASC}_{\mathrm{current\_option}} + \alpha_2 \,\mathrm{ASC}_{\mathrm{option\_B}} + \alpha_3 \mathrm{ASC}_{\mathrm{current\_option}} \times \mathrm{Canada} + \alpha_4 \,\mathrm{ASC}_{\mathrm{option\_B}} \times \mathrm{Canada} + \alpha_5 \,\mathrm{ASC}_{\mathrm{current\_option}} \times \mathrm{Denmark} + \alpha_6 \,\mathrm{ASC}_{\mathrm{option\_B}} \times \mathrm{Denmark} + \alpha_7 \,\mathrm{ASC}_{\mathrm{current\_option}} \times \mathrm{Japan} + \alpha_8 \,\mathrm{ASC}_{\mathrm{option\_B}} \times \mathrm{Japan} + \alpha_9 \,\mathrm{ASC}_{\mathrm{current\_option}} \times \mathrm{Netherlands} + \alpha_{10} \,\mathrm{ASC}_{\mathrm{option\_B}} \times \mathrm{Netherlands} + \alpha_{11} \,\mathrm{ASC}_{\mathrm{current\_option}} \times \mathrm{Poland} + \alpha_{12} \,\mathrm{ASC}_{\mathrm{option\_B}} \times \mathrm{Poland} + \alpha_{13} \,\mathrm{ASC}_{\mathrm{current\_option}} \times \mathrm{Spain} + \alpha_{14} \,\mathrm{ASC}_{\mathrm{option\_B}} \times \mathrm{Spain} + \alpha_{15} \,\mathrm{ASC}_{\mathrm{current\_option}} \times \mathrm{Swizterland} + \alpha_{16} \,\mathrm{ASC}_{\mathrm{option\_B}} \times \mathrm{Swizterland} + \alpha_{17} \,\mathrm{ASC}_{\mathrm{current\_option}} \times \mathrm{UK} + \alpha_{18} \,\mathrm{ASC}_{\mathrm{option\_B}} \times \mathrm{UK} + \boldsymbol{\beta_1\, RISK} + \beta_2\, Flare\ up\ frequency + \beta_3\, Flare\ up\ visible\ in\ the\ Face + \beta_4\, Flare\ up\ in\ other\ visible\ areas + \beta_5\, Severe\ flare\ up + \beta_6\, extra\ monthly\ expenditure \quad (2)$$

Where, as in Section 3.2: the α coefficients correspond to the alternative-specific constants (ASCs) for the status quo ("current") option and Option B, with Option C defined as the reference alternative. Country effects are captured through a set of dummy variables, which are interacted with the ASCs to allow for systematic cross-country differences in baseline preferences.

The following parameters are specified as random and assumed to follow a normal distribution: α_1, α_2, β_1, β_2, β_3, β_4 and β_5 . All remaining coefficients are treated as fixed.

In Table D.2, WTP estimates are derived as the ratio of each non-monetary attribute coefficient β_k (excluding coefficients associated with alternative-specific constants) to the coefficient on the monetary attribute, namely the additional monthly expenditure (β_6). Specifically, the marginal WTP for attribute k is calculated as: $WTP_k = -\beta_k / \beta_6$.

As in the analysis presented in the main body of this paper, estimation was undertaken in willingness-to-pay (WTP) space. Consequently, monetary valuations for the non-cost attributes are estimated directly, rather than being derived ex post as ratios of estimated preference coefficients.

Table C.1. Mixed logit model estimation among the non-sensitised sample

Direct Utility Model

Parameter	Type	Estimate	Confidence Interval	Robust S.E.	Robust T-Ratio.
WTP to reduce the probability of becoming sensitized by 10 percentage points	Mean	5.83	[4.56, 7.09]	0.65	9.00
	Standard Deviation	16.63	[14.42, 18.85]	1.13	14.71
WTP to avoid one extra day of flare-up	Mean	0.32	[0.26, 0.37]	0.03	11.13
	Standard Deviation	0.63	[0.53, 0.73]	0.05	12.50
WTP to avoid flare-up visible in the face (compared to non-visible areas)	Mean	9.16	[6.15, 12.17]	1.54	5.96
	Standard Deviation	27.92	[22.14, 33.70]	2.95	9.46
WTP to avoid flare-up in other visible areas (compared to non-visible areas)	Mean	4.86	[3.10, 6.61]	0.90	5.42
	Standard Deviation	6.21	[2.42, 14.84]	4.40	-1.41
WTP to avoid severe flare up (compared to non-severe (i.e. mild or moderate))	Mean	4.74	[2.08, 7.41]	1.36	3.49
	Standard Deviation	26.72	[21.35, 32.09]	2.74	-9.75
Extra monthly expenditure (USD PPP)	Fixed	-0.06	[-0.06, -0.05]	0.00	-27.44
ASC_option current	Mean	-1.56	[-2.34, -0.78]	0.40	-3.90
	Standard Deviation	4.67	[4.29, 5.06]	0.20	23.76
ASC_option B	Mean	0.57	[0.15, 1.00]	0.22	2.62
	Standard Deviation	3.28	[3.09, 3.47]	0.10	33.84
ASC_option current × Canada	Fixed	-0.29	[-1.30, 0.72]	0.52	-0.56
ASC_option B × Canada	Fixed	0.57	[0.00, 1.14]	0.29	1.96
ASC_option current × Denmark	Fixed	-0.92	[-1.90, 0.05]	0.50	-1.86
ASC_option B × Denmark	Fixed	-0.12	[-0.70, 0.46]	0.30	-0.42
ASC_option current × Japan	Fixed	0.95	[0.02, 1.88]	0.47	2.01
ASC_option B × Japan	Fixed	0.98	[0.40, 1.56]	0.29	3.32
ASC_option current × Netherlands	Fixed	-1.82	[-2.95, -0.69]	0.58	-3.16
ASC_option B × Netherlands	Fixed	0.56	[-0.01, 1.13]	0.29	1.93
ASC_option current × Poland	Fixed	1.05	[0.06, 2.05]	0.51	2.08
ASC_option B × Poland	Fixed	0.53	[-0.04, 1.10]	0.29	1.84
ASC_option current × Spain	Fixed	-0.76	[-1.87, 0.35]	0.57	-1.34
ASC_option B × Spain	Fixed	-0.45	[-1.00, 0.11]	0.28	-1.58
ASC_option current × Switzerland	Fixed	0.00	[-1.08, 1.08]	0.55	-0.01
ASC_option B × Switzerland	Fixed	0.11	[-0.49, 0.72]	0.31	0.37
ASC_option current × UK	Fixed	0.40	[-0.60, 1.41]	0.51	0.78
ASC_option B × UK	Fixed	1.19	[0.61, 1.77]	0.30	4.00
Log-Likelihood	-19 522.74				
AIC	39 107.48				
BIC	39 364.82				
Number of observations	4 962				

Note: WTPs are expressed in USD PPP per Month. ASC stands for alternative specific constant and should not be interpreted as WTPs.

Table C.2. Country-level monthly willingness to pay to avoid the risk of skin sensitisation attribute among the non-sensitised sample from the direct utility model

Weighted average WTP for a 10-percentage point risk reduction in the risk of skin sensitisation

	WTP to avoid one extra day of flare-up	**Severity of each flare up**	**Location of each flare up**	
			Visible in face	**Other visible areas**
	WTP to avoid one extra day of flare up	WTP to avoid one extra severe case	WTP to avoid case being visible in face	WTP to avoid case being in other visible areas
Canada	0.617 [0.549, 0.685]	5.14 [4.46, 5.81]	9.66 [8.93, 10.38]	4.88 [4.79, 4.97]
Denmark	0.549 [0.473, 0.625]	4.76 [4.02, 5.50]	8.63 [7.75, 9.52]	4.88 [4.78, 4.99]
Japan	0.562 [0.491, 0.632]	4.79 [3.98, 5.60]	9.59 [8.75, 10.43]	4.84 [4.74, 4.93]
Netherlands	0.568 [0.498, 0.639]	5.08 [4.41, 5.74]	9.73 [9.00, 10.47]	4.77 [4.68, 4.86]
Poland	0.553 [0.479, 0.627]	4.11 [3.38, 4.84]	9.18 [8.40, 9.96]	4.86 [4.78, 4.95]
Spain	0.547 [0.467, 0.626]	4.81 [3.97, 5.65]	8.80 [7.91, 9.68]	4.80 [4.70, 4.90]
Switzerland	0.562 [0.483, 0.641]	4.86 [4.06, 5.66]	9.34 [8.42, 10.25]	4.90 [4.79, 5.00]
UK	0.627 [0.559, 0.695]	5.54 [4.78, 6.29]	9.49 [8.62, 10.37]	4.87 [4.78, 4.96]
US	0.610 [0.536, 0.685]	4.51 [3.64, 5.37]	8.96 [8.12, 9.80]	4.90 [4.80, 4.99]
Cross-country average	0.577	4.84	9.26	4.86

Note: Respondents who answered "No" to the question "*Taking into account the information presented previously, would you be willing, in principle, to increase your monthly spending to switch to products labelled 'Skin Sensitiser Free'?"* were excluded from the analysis. WTP expressed in USD PPP per month. The cross-country average is calculated as the simple average of the country values.

Valuing a reduction in the risk of skin sensitisation

Exposure to chemicals has been shown to cause skin sensitisation, leading to chronic conditions such as allergic contact dermatitis. Beyond physical symptoms, skin sensitisation can also reduce one's quality of life, impair productivity and cause psychological distress. Despite its prevalence, information on the value that the public places on avoiding chemical-induced skin sensitisation remains limited.

To fill this gap, the present paper details a stated preference survey estimating individuals' willingness-to-pay to avoid the frequency, severity, and visibility of skin flare-ups in nine countries (Canada, Denmark, Japan, the Netherlands, Poland, Spain, Switzerland, the United Kingdom, and the United States). It also explores how other socio-economic factors such as age, gender and income affect the valuation of skin sensitisation.

This work is part of a series of large-scale studies resulting from the Surveys on Willingness-to-Pay to Avoid Negative Chemicals-Related Health Effects project that intends to establish internationally comparable values for the willingness-to-pay to avoid negative health effects due to exposure to chemicals. The results from this paper are expected to be widely applicable in analyses assessing the value of reduced skin sensitisation in a range of chemical and environmental contexts.

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