

The effect of optimised online advertising on the uptake of COVID-19 vaccines in Hong Kong

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PRINCIPAL INVESTIGATOR

School of Public Health, The University of Hong Kong, Hong Kong

Prof. Joseph T. WU (PI)

CO-INVESTIGATORS

School of Public Health, The University of Hong Kong, Hong Kong

Prof. Gabriel M. LEUNG

School of Public Health, The University of Hong Kong, Hong Kong

Dr Kathy Sze Man LEUNG

Laboratory of Data Discovery for Health, Hong Kong

Dr Leonie R. J. RAIJMAKERS

School of Public Health, The University of Hong Kong, Hong Kong

Mr. Christopher Kehan ZHANG

Summary

Background:

The COVID-19 global pandemic is having a profound impact on lives across the globe, including those in Hong Kong. Despite the efficacy of COVID-19 vaccines, recent polling data in Hong Kong suggests that opinion towards a COVID-19 vaccine is divided, and overall tends to be very negative. While some consider the vaccine as a path to return to pre-pandemic normalcy, others have shown great hesitancy for a variety of reasons. Although Asian countries have usually shown higher levels of confidence and compliance in vaccination in general, recent studies and interviews in Hong Kong showed that the COVID-19 vaccine acceptance rate among the general Chinese population was as low as 37.2%. Even with accounting for biases in participation population due to the study set-up, the low acceptance rate is far off the 70% required to reach herd immunity,¹ and is cause for serious concern for the relevant health authorities.

Two global-scale surveys conducted in June, July and August 2020 by Ipsos & the WEF (2020) and Lazarus et al (2020) showed 71.5-74% of adults intended to take the vaccine. A new survey by Ipsos in January 2021 indicated vaccine intent was rising across many countries, with most surveyed countries scoring well above 70%. In comparison, Hong Kong vaccination intention is notably low, scoring below Russia's lagging 42%. Besides this strong vaccine hesitancy amongst the general population, even healthcare workers have indicated reluctance in getting vaccinated, with nurses' vaccination intention at 63%.² Such significant vaccine hesitancy throughout the population – even permeating into the views of healthcare workers who are a frontline priority group heavily relied on in the fight against the COVID-19 pandemic – could rapidly escalate an already precarious public health situation. On top of this general scepticism towards vaccination, reports over safety concerns in relation to both the BioNTech and SINOVAR vaccines have caused an even more pronounced surge in vaccine hesitancy. As a result, this situation calls for an effective, evidence-based policy intervention.

Aim:

We aim to evaluate the effectiveness of using the Google and Facebook advertising platforms on influencing the uptake of COVID-19 vaccines in Hong Kong.

When completed, the rich database compiled through this proposed study will provide increased insight into vaccine hesitancy in Hong Kong. Insights from the optimised online advertising trial can aid in providing crucial technical and theoretical support to the relevant health authorities for any potential evidence-based policy intervention in addressing vaccine hesitancy issues or the public's concerns towards vaccines in Hong Kong.

Hypothesis:

The overarching hypothesis is that an optimised online advertising campaign can get more people vaccinated. A sub-hypothesis is that providing a direct link to making a booking on the adverts will aid in flow-through, increasing bookings compared to when such a link is absent. Another sub-hypothesis is that certain adverts, addressing different emotions, will be more successful than others (e.g. we expect advertisements addressing reopening of travel will be relatively more successful). In addition, we believe the study will provide necessary insights into and a more thorough understanding of the current vaccine hesitancy status, main drivers of vaccine

hesitancy as well as the general public's attitudes and tendencies towards vaccines in Hong Kong. As such we hypothesise that insights from the study can support the design of better strategies to counter vaccine hesitancy in Hong Kong.

Design:

People will be shown ads encouraging vaccination, addressing fears about vaccination, or providing additional information about the vaccines, as determined by the Google optimisation algorithm. Those who click on the ads will be referred to one of the targeted landing pages designed to promote vaccination. These pages will be developed and maintained by the investigators together with the HKU-Med public relation specialists. Each page will emphasise certain specific aspects of the vaccines, e.g. their direct or indirect benefits to the individual, the community, or the families of those vaccinated.

With this test design we aim to compare the differences in response to four different variables:

- firstly, the differences between advertising and not advertising,
- secondly, advertising with a direct link to the vaccine booking page vs. advertising without the link,
- lastly, comparing the effectivity of different types of advertising that appeal to different topics and emotions.

To control for the difference of advertising vs not advertising, we will stagger days and hours within days throughout our testing period to have alternating periods where no advertising and advertising take place. We aim to discover any patterns in daily and hourly vaccine sign-ups or vaccine rates that can be optimised. In addition, we could compare vaccination sign up data from a month before and a month after our testing run to the vaccine sign-up/rate data collected during our test run to control for times with no direct advertising.

To test whether enabling direct flow-through from advertising actually increases sign-up rates, our set-up will have both pages with and pages without a direct link to the COVID-19 Vaccination Program Booking System. The ads with and without the direct link will be randomly shown to users on the advertising platforms chosen. Though the assumption is that providing a direct link will enable flow-through and increase rates of vaccination in response to the advertisement, this assumption has not been explicitly tested before.

Lastly, to test for optimised targeting strategy, we propose to make a diversity of advertisements, that each address a different reason for getting vaccinated. Each of these will also address a different emotion, as set out by Poels & Dewitte 2018, which claims targeting certain emotions during advertising aids in both advertising efficacy and direct action. A similar approach testing different types of messaging has been used in campaigns for HPV vaccination (Mohanty et al 2018) and anti-smoking (Yom-Tov et al 2016) campaigns. Current topics we would like to start with include:

- Family (emotions: positive, social, responsibility, freedom of choice), landing page example 1: <https://christopherkzhang.wixsite.com/website-3> ,
- Travel (emotions: positive, awe/sensation, self-focused, freedom of choice), landing page example 2: <https://christopherkzhang.wixsite.com/website-2> ,
- Community/Self Protection (emotions: empowerment, fear, anxiety, hope, community, responsibility), landing page example 3: <https://christopherkzhang.wixsite.com/website-1> ,
- Data/Information and Protection (main goal: inform; emotions, though less pronounced: empowerment, fear, hope), landing page example 4: <https://christopherkzhang.wixsite.com/website> ,
- Convenience (emotions: positive, efficiency/convenience, power to avoid annoyance), landing page example 5: <https://christopherkzhang.wixsite.com/website-4>

We expect to build our data set on non-identifying user characteristics and statistics reported by Google and Facebook, such as breakdowns by age, sex, educational level,

etc. The landing pages created and maintained by the investigators will record the I.P. addresses and timestamps of each visit to landing pages. These I.P. addresses and timestamps will be used in outcome linkage at the Office of the Government Chief Information Officer (OGCIO) by anonymously tracking the appointment and vaccination status of these participants. Personal identifiers, such as participants' name, telephone number and address will not be sought or accessible to the investigators. None of the information collected or reported can or will be used to infer the identity of the participants by the investigators.

We suggest advertising on two platforms: Google Adwords and Facebook Advertising. Google Adwords is used due to its broad reach across age and other demographics, as well as the ability of the platform to target ads to searches from people within a selected geographic region. The geographic audience will be set to targeting those in Hong Kong SAR. Initially, we will let Google randomise its advertising and optimise targeting over time using its own algorithms. This is done to check for overlap or diversification from the associated terms we have pre-identified.

Facebook advertising has previously been used for multiple other vaccination and health campaign studies, showing some success. Facebook is chosen also due to its broader user demographic, compared to other popular platforms such as Instagram, which tend to have a stronger representative base amongst those in their 20s. For Facebook advertising we will target people who are, according to their demographics, eligible for vaccination.

Should we wish to use targeting through pre-identified search terms, we aim to use those from Google that come out as part of the optimised range, and alternatively any combination of the following prior-identified Google search keywords in one of the following categories:

1). Vaccine-related;

Keywords: vaccine; vaccines; vaccination; vaccinate; vaccinated; jab; dose; 疫苗; 针; 針; 針劑; 藥劑; 针剂; 药剂; BioNTech; Pfizer; Fosun; pharmacy; pharma; 輝瑞; 復星; 辉瑞; 复星; 醫藥; 藥物; 医药; 药物; comirnaty; 復必泰; 复必泰; SinoVac; 科興; 科兴; CoronaVac; 克爾來福; 克尔来福; AstraZeneca; 阿斯利康; side-effect; side-effects; 副作用; 接種; 接种; pharmaceutical; 藥; 製藥; 药; 制药;

2) COVID19-related;

Keywords: COVID; COVID-19; covid19; Coronavirus; novel; SARS-CoV-2; severe; acute; respiratory; syndrome; virus; pneumonia; infect; infection; infected; corona; contagious; cough; inflammation; lung; fever; droplet; droplets; headache; test; tested; testing; positive; negative; antibody; nucleic; acid; case; cases; new; mask; facemask; face; 新冠; 新型; 冠狀; 病毒; 嚴重; 急性; 呼吸; 症狀; 肺炎; 感染; 染病; 傳染; 咳嗽; 發炎; 炎症; 燒; 飛沫; 傳播; 頭痛; 頭疼; 檢測; 測試; 確診; 診斷; 陽性; 陰性; 抗體; 抗原; 核酸; 案例; 口罩; 臉; 严重; 传染; 发炎; 烧; 飞沫; 传播; 头痛; 头疼; 检测; 测试; 确诊; 诊断; 阳性; 阴性; 抗体; 脸;

3) Travel-related;

Keywords: destination; travel; holiday; opening; visit; journey; foreign; activity; activities; Japan; South Korea; China; India; Philippines; Indonesia; Bali; Australia; New Zealand; Europe; United Kingdom; United States; UK; US; France; London; New York; Paris; Amsterdam; Melbourne; Sydney; Tokyo; Kyoto; Seoul; Beijing; 目的地; 旅遊; 旅行; 假期; 放假; 開放; 開通; 訪問; 旅程; 旅途; 外國; 活動; 日本; 韓國; 南韓; 中國; 印度; 菲律賓; 印尼;

峇厘島; 澳洲; 紐西蘭; 歐洲; 英國; 美國; 法國; 倫敦; 紐約; 巴黎; 阿姆斯特丹; 墨爾本; 悉尼; 東京; 京都; 首爾; 北京; 旅游; 开放; 开通; 访问; 外国; 活动; 韩国; 南韩; 中国; 菲律宾; 巴厘岛; 澳大利亚; 新西兰; 欧洲; 英国; 美国; 法国; 伦敦; 纽约; 墨尔本; 东京; 首尔;

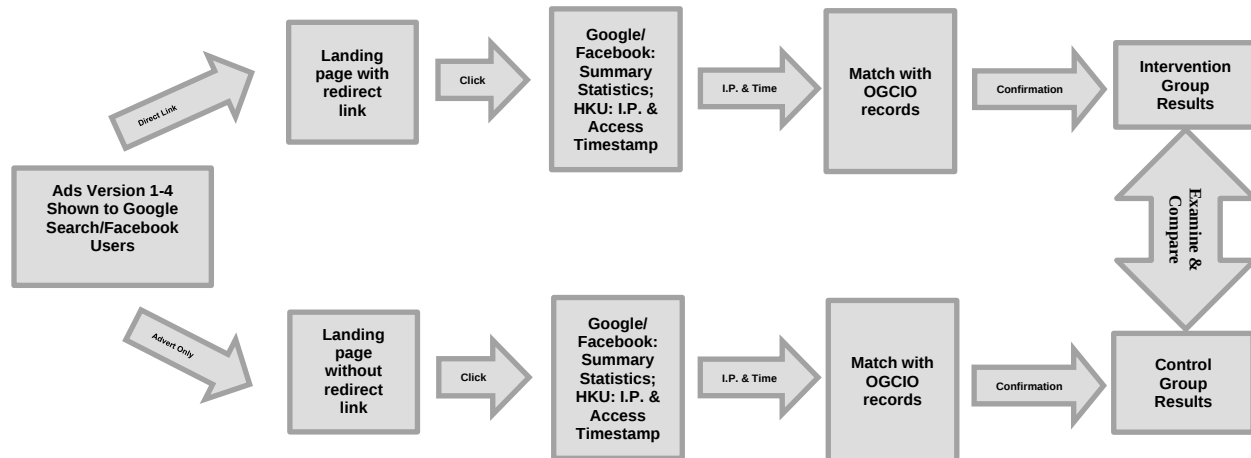
4) Socialising-related;

Keywords: party; school; socialise; social; socialize; meet; meet-up; cafe; hiking; gathering; surfing; sunshine; beach; tan; sunbathing; swimming; gym; sports; exercise; 派對; 開趴; 學校; 社交; 見面; 聚會; 限聚; 餐廳; 登山; 衝浪; 陽光; 沙灘; 曬太陽; 日光浴; 游泳; 游水; 健身; 鍛鍊; 派对; 开趴; 学校; 见面; 聚会; 餐厅; 冲浪; 阳光; 沙滩; 晒太阳; 锻炼;

5). Family-related;

Keywords: family; homesick; grandparents; protect; kindness; children; 家庭; 家人; 屋企; 保護; 友好; 保护; 老人; 小孩;

A summary of the data collection process is shown in the flow diagram below:



OGCIO: Office of the Government Chief Information Officer

A broader overview of the testing and data collecting protocol is available at the end of the document.

Main outcome measures:

We will measure click-through rates, conversion and vaccination rates by aggregated demographics, keywords, ads, and information pages. The primary outcome of interest would be vaccination (booking & attendance) rates.

Click-through rate: defined as the number of clicks on the ads divided by the number of times ads are shown/viewed.

Conversion rate 1: the number of page visits to the governmental booking page divided by the number of times ads are shown/viewed.

Conversion rate 2: the number of vaccination appointments booked linked to viewings of our ads divided by the number of times ads are shown/viewed.

Conversion complexity: the average number of clicks on the page per individual visit before a visit results in an appointment booking.

Vaccination rate: the number of actual vaccination uptake generated/encouraged by our ads divided by the number of times ads are shown/viewed. Can be split into initial vs. full vaccination uptake.

Alternatively – especially when data on direct linkages between IP address views and associated vaccinations are not available – we will look at overall population vaccination rates/bookings per day, and their association with daily timing of advertisements.

Analysis:

We will first examine the effectiveness of putting a direct link to the vaccination booking system on our landing pages by comparing the outcomes of the intervention and control groups. We will also compare the outcomes from all landing pages across different contents, to understand possible differences in levels of content impact. We will then further examine and study the effectiveness of our online advertising campaign as a whole and among different subgroups (e.g. stratified by age and sex) within the Hong Kong population.

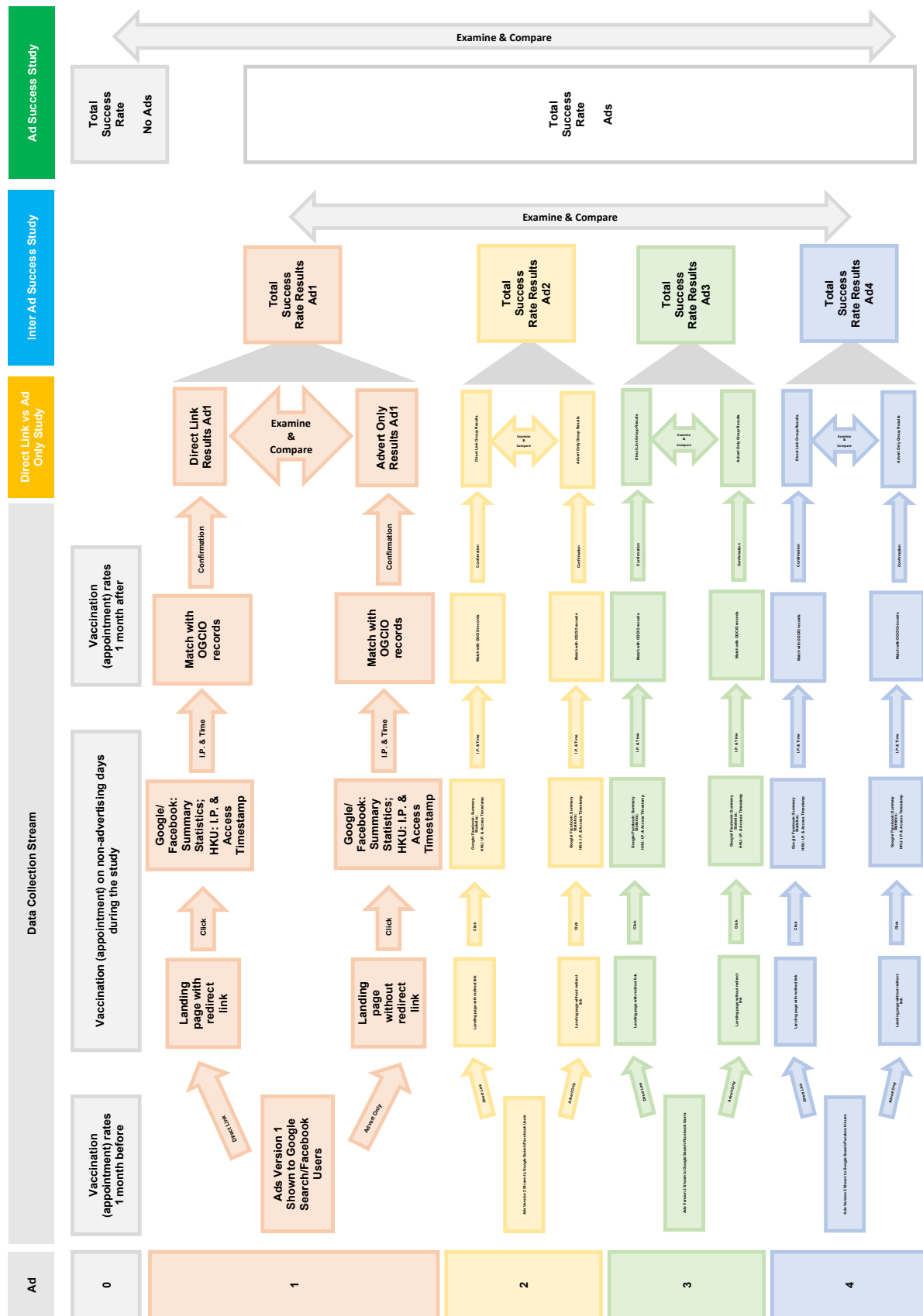
From the above analyses, we will extract a conversion optimisation algorithm in order to build an optimised advertising campaign/strategy.

For Google Adwords:

We will use the following two conversion signals: 1) Clicks from the information pages to the booking system; 2) A list of the I.P. addresses and access timestamps passed along to the Office of the Government Chief Information Officer (OGCIO) for the confirmation of appointment and uptake of vaccination, who will return the list with an indication of which people made appointments and when each individual actually got vaccinated. Google Ads can be set to automatically optimise between a group of ads, judging which ads are most successful at what times/geographies etc. and so running an ad campaign towards its most effective level. Much of the information, and all personal information, in these algorithms will not be accessible to the researchers of this study.

For Facebook Advertising:

Same as for Google Adwords. In addition, Facebook can give an extra value: with an automated link created between IP addresses shown the ads and later identified as located within the geographical location of a known vaccination clinic. This is incorporated into an automated optimization algorithm used by Facebook, and besides an indicator of a visit having taken place does not provide extra personal information to the researchers of the study. It is, however, suspected to not be an entirely optimised measure due to vaccines being available in general clinics and visits could be linked to other medical indications. As such, we largely rely on the data passed on by the OGCIO.



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