

GRATITUDE, WARM GLOW, AND THE ROLE THEY PLAY IN THE PAY-IT-FORWARD  
MODEL

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## **ABSTRACT**

Margaret Byrne: Gratitude, Warm Glow, and the Role they Play in the Pay-it-Forward Model  
(Under the Direction of Bruce Fried)

Prosocial interventions encourage voluntary actions that benefit others to achieve medical and/or public health outcomes. Pay-it-forward is a prosocial approach that includes offering an individual a gift (an STD test) and then asking if that individual would like to give a gift to another person. This approach has shown promising results among gay, bisexual, and men who have sex with men (GBMSM) in China, but there is limited understanding about the participant experience and how this intervention works.

This study aims to understand prosocial behavior, recipient gratitude and warm glow, and the impact these behaviors can have on an individual's health. Aim 1 synthesizes the peer reviewed literature on prosocial interventions used to promote public health and medical outcomes using a systematic review. Aim 2 and 3 explore the experience of the participant in pay-it-forward specifically by describing their experience when they receive a gift and the warm glow feeling that people feel when they give to others (Aim 2) and determine whether receiving a gift from pay-it-forward is associated with transient feelings of gratitude and changes in a biomarker, oxytocin (Aim 3).

Our systematic review was informed by the Cochrane handbook, and the data extraction and synthesis consisted of three parts: a transformation of quantitative and mixed methods results to qualitative narratives, a data based convergent synthesis, and a meta-aggregation interpretation.

Our analysis of pay-it-forward was conducted using data from a two-armed study comparing pay-it-forward to a free test as part of a research study. In aim 2 we conducted a qualitative thematic analysis to identify facilitators and barriers of implementing pay-it-forward. In aim 3 we conducted confirmatory factor analysis, difference-in-difference models, and regression analysis to compare demographic differences between the two groups and individual oxytocin changes.

The systematic review found that individual interests and community connectedness are vital aspects of prosocial interventions. Informed by the systematic review, the qualitative analysis found that the pay-it-forward approach highlights the need for connection, support, and health services for gay men in China. The quantitative analysis found insignificant results but determined that the STD clinic environment itself may alter the biomarker.

To Matt, and the life we are building.

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## LIST OF ABBREVIATIONS

GBMSM	gay, bisexual, and men who have sex with men
HIV	human immunodeficiency virus
LGBTQI	lesbian, gay, bisexual, transgender, queer, and intersex
MSM	men who have sex with men
PIF	pay-it-forward
RCT	randomized controlled trial
STD	sexually transmitted disease

## CHAPTER 1: INTRODUCTION

### Background

There is a growing body of literature that finds a connection between helping others and health outcomes. A prosocial intervention encourages voluntary actions that benefit others to achieve medical and/or public health outcomes [1]. The literature on prosocial interventions is broad and interdisciplinary. The literature includes prosocial behaviors such as volunteering, donating blood/organs, donating money, and more. One prosocial intervention in particular has shown promising evidence to improve health outcomes. The pay-it-forward approach includes offering an individual a gift and then asking if that individual would like to give a gift to another person [2].

In 2018-2019, a randomized controlled trial was conducted to examine the effectiveness of a pay-it-forward approach aimed at increasing gonorrhea and chlamydia testing among gay, bisexual, and men who have sex with men (GBMSM) in China [2]. In this case, the gift was an STD test. Participants were assigned to one of three groups: standard-of-care, pay-it-forward (received free test and asked to donate for another's test), and pay-what-you-want (received free test and asked to donate any amount for another's test). This study found promising results that the pay-it-forward approach can increase rates of gonorrhea and chlamydia testing among GBMSM in China [2]. Previous pay-it-forward studies have found that participants indicate a feeling of warm glow may increase their likelihood of helping others [3]. However, the experience for those participating in pay-it-forward is not fully understood. It is important to

understand how this approach works to enable future implementation in healthcare settings and leverage prosocial interventions to encourage participation.

This pilot study aims to further understand what participants feel when they receive a gift and the warm glow feeling of giving to others. In this study, implementation strategies were tested at one MSM-led clinic and one STD clinic in Guangzhou, China. One group received standard pay-it-forward, and the other received free STD tests as part of a research study. This study analyzed the experience of participants in the pay-it-forward approach and in the standard free testing arm. We used interview responses to understand the experience of participants, and then we looked at oxytocin biomarkers as an unbiased indicator to provide additional insight. The central hypothesis was that the pay-it-forward approach incorporates recipient gratitude that creates a warm glow and desire to give. This can lead to improved public health and medical outcomes. Compared to free testing as part of a research study, we hypothesized that individuals receiving a free test due to the kindness of their community will experience gratitude and a connection to their community. This study sought to understand prosocial behavior, recipient gratitude and giver glow, and the impact these behaviors can have on an individual's health.

#### Dissertation Aims

Aim 1: Synthesize the peer reviewed literature on prosocial interventions used to promote public health and medical outcomes using a systematic review. This aim consists of a systematic review focusing on interventions that have used prosocial elements to improve public health and medical outcomes. The systematic review followed the steps outlined in the Cochrane Handbook for Systematic Reviews of Interventions [4]. The screening of this systematic review was conducted using Covidence. Our data extraction and synthesis consisted of the transformation of

quantitative and mixed methods results to qualitative narratives, a data based convergent synthesis, and a meta-aggregation interpretation

Aim 2: Describe the participant experience when they receive a gift and the warm glow feeling that people feel when they give to others. The goal of this aim was to conceptualize the feelings that individuals experience during the pay-it-forward approach. This study used interview data to test the extent to which gratitude and connectedness play a role in the function of the pay-it-forward approach.

Aim 3: Determine whether receiving a gift as part of pay-it-forward is associated with transient feelings of gratitude and changes in oxytocin levels. We compared oxytocin levels prior to pay-it-forward compared to oxytocin levels after receiving pay-it-forward. We expected to see an oxytocin increase associated with the pay-it-forward model, as these participants are given something as a gift by a community member. This analytical approach was quantitative and incorporated confirmatory factor analysis, difference-in-difference models, and regression analysis.

This study will contribute useful and innovative insight into the concept of gratitude in prosocial interventions in the context of the pay-it-forward model. The lessons learned in this analysis will contribute to further implementation of pay-it-forward models in healthcare settings. Additionally, future researchers will further understand the gratitude related to and indicators of warm glow to use when utilizing and evaluating this pay-it-forward approach to achieving various behavioral and health outcomes.

### Significance

In 2018, there were 133,156 new cases of gonorrhea in China and in 2019, there were 50,874 reported new cases of chlamydia [5, 6]. Gonorrhea and Chlamydia are persistent concerns



globally and in China. Gonorrhea rates exhibited an increasing trend from 2014 - 2018, and chlamydia rates increased from 2018-2019 [5, 6]. There are dual tests for gonorrhea and chlamydia in China that cost approximately \$22, however, an online survey of GBMSM in two provinces in China found that only about 30% of the men who participated in the study tested for chlamydia or gonorrhea [7]. Efforts to increase testing for gonorrhea and chlamydia among GBMSM in China have the potential to improve the health of a significant population and prevent further spread of these diseases. Preliminary research has indicated that the pay-it-forward model can increase gonorrhea and chlamydia testing rates among GBMSM, but the how this model works is less understood [2]. The warm glow literature focuses on the feeling an individual gets when they give to others, but we are interested in the intersection between receiving and giving. This will have implications for prosocial public health interventions in which a gift is given to a person and then the same person can give to support others.

As there is a sensitive emotional context of STD testing among GBMSM in China, Bien and colleagues (2015) sought to determine the STD testing preferences of GBMSM in China [8]. Findings indicated the preference for non-discriminatory and discrete testing, among others. This study takes the shame of STD testing into consideration by incorporating confidentiality and creating a space for community support attempts to alleviate the shame and isolation that can be associated with an STD diagnosis.

This study organized and succinctly summarized the current body of literature focusing on prosocial interventions and their impact on health. We focused interventions that incorporate prosocial and/or voluntary elements to improve health or medical outcomes in either the sender or the recipient of such altruistic acts. This systematic review developed themes and summarized

the findings of studies that identify the health-related outcomes of prosocial interventions in the literature.

As a promising method to influence behavior in healthcare settings, this research adds to our understanding of the pay-it-forward model and how people respond to the gift they are given. While preliminary tests of this approach in China indicated success, further research is needed to evaluate pay-it-forward. The findings from this study will inform future implementation by describing factors that spur participation in the program. This study provides researchers insight into the role of community engagement in the pay-it-forward approach.

Oxytocin is an objective measure that can be used to measure the impact of the pay-it-forward model on participants. Gratitude alone is a subjective measure, that is measured with potentially biased indicators. Oxytocin is a hormone in the body that is often associated with reproduction and love [9]. This study focuses on whether participation in the pay-it-forward model is associated with increased oxytocin levels.

The contribution of this study is to further explore the pay-it-forward process to inform implementation of this model in the future. Aim 1 uses the literature on prosocial interventions to formulate themes about how these interventions may work. Aim 2 explores the experience of the participant going through pay-it-forward. Aim 3 measures and analyzes oxytocin levels before and after the implementation of the pay-it-forward approach.

## **CHAPTER 2: PROSOCIAL INTERVENTIONS TO IMPROVE HEALTH OUTCOMES: A SYSTEMATIC REVIEW**

### Background

Prosocial interventions encourage voluntary actions that benefit others to achieve medical and/or public health outcomes [1]. Prosocial actions can range from lending a hand with grocery bags to donating an organ. Prosocial behavior is a large part of human interaction and can be motivated by a variety of reasons, either altruistic or egoistic [10]. A growing literature draws on prosocial interventions to improve health or medical outcomes [11, 12]. Prosocial interventions have shown to improve mental [13] and physical [14] health.

Previous research has explored the relationship between helping others and improving health outcomes. Studies have shown that caregiving for others can provide physical or emotional benefits for the helper [15, 16]. Additionally, research during the Covid-19 pandemic indicated that public health messaging that included prosocial appeals were able to elicit emotion and were associated with higher levels of compliance [17]. The desire to help others could be useful in slowing the spread of transmittable diseases such as COVID-19 and sexually transmitted diseases (STD).

An increasing number of studies that have used prosocial Interventions to achieve health outcomes, but there has been no systematic review of their effectiveness. Similar systematic reviews on the topic focused on specific interventions such as volunteering, but none have focused on prosocial interventions [18]. A prosocial intervention typology and understanding of

effectiveness would enable future researchers to continue to effectively implement interventions that utilize prosocial actions to improve health. We sought to synthesize the current literature and better understand the relationship between helping others and improving health outcomes. This can inform the development of prosocial interventions in public health and medicine and improve existing interventions.

This systematic review aims to synthesize the evidence on the effectiveness of prosocial interventions focused on public health and medical outcomes.

## Methods

We used the PRISMA checklist to report the findings and organized the review according to the Cochrane handbook. The review was registered in Prospero (CRD42021288888).

## Inclusion criteria

To qualify for inclusion in this systematic review, a study needed to have a comparator group and a pro-social intervention group. We only included studies with a comparator group because there are many single-arm descriptive studies that provide limited information about the efficacy of the intervention. We defined pro-social interventions as those that encourage voluntary actions that benefit others to achieve medical and/or public health outcomes. Studies needed to be in the English language and published in a peer-reviewed journal. We only included studies reporting on public health or medical outcomes.

## Search Strategy

We searched for studies and reviews in MEDLINE (via PubMed), Embase, CINAHL, PsycInfo, and Scopus on February 23, 2023. A medical librarian assisted in the development of the search strategy. The search included terms for (a) altruism and prosocial behavior (e.g. pay-it-forward, acts of kindness, generosity), (b) health or medical outcomes (e.g. public health,

health behavior, health messag\*), and (c) study type (developed from a validated search filter for controlled trials)[19]. We used medical subject headings (MeSH) or Emtree subject headings where appropriate, and subject terms where applicable. An additional search for ongoing clinical trials was conducted in ClinicalTrials.Gov.

### Study Selection

The title and abstract of each study were reviewed by one independent reviewer. Then the full text review was conducted by two independent reviewers (MB and RT). When the reviewers agreed, the decision was finalized. If the two reviewers did not agree on a study, a third independent reviewer (JT) made the final decision.

### Assessment of methodological quality

We used the Cochrane Collaboration's tool to assess risk of bias in RCT studies [20]. For non-randomized studies, the ROBINS-I tool was used to assess the risk of bias [21]. The results of these assessments can be found in Appendix 1.1 and 1.2.

### Data Extraction

Qualitative and quantitative data from the studies was extracted manually by three reviewers (MB, RT, and TH). The evidence extracted in this review is qualitative in nature, coming from textual findings rather than statistical findings. Each reviewer extracted a third of the studies. We used a mixed methods synthesis because it allowed us to combine themes from qualitative and quantitative data and consider the findings together, rather than separately. Our data synthesis consisted of three parts: a transformation of quantitative and mixed methods results to qualitative narratives, a data based convergent synthesis, and a meta-aggregation interpretation [22]. We completed this synthesis first by describing the main findings as a qualitative narrative to facilitate comparison between studies. First, we completed a table of the

central finding from each quantitative study. We also extracted the central finding from the mixed methods studies. In addition to the main findings, we also extracted secondary findings from quantitative data into qualitative form. The central finding was taken directly from the text as the main finding from the study. The secondary findings were findings statements made by the authors that did not directly answer the research question but were still included. The reviewers identified key findings first by looking at the concluding statement in the abstract and/or discussion section of the paper. Then one individual reviewer repeated multiple reads of the studies and identified secondary finding statements to include from results and discussion sections.

#### Data Synthesis and Presentation

We used a mixed methods synthesis for analysis [23]. There was substantial heterogeneity in the research designs and outcomes, and this method allowed us to synthesize the literature into distinct findings. The qualitative findings were analyzed using meta-aggregation techniques. The basis of meta-aggregation is that the authors do not attempt to re-interpret the included studies, but rather categorize and present the findings of the studies [22]. We determined that categorized findings would be the most useful outputs of this review because these categories could be used to inform future implementation of prosocial interventions. The reviewers grouped the qualitative statements (representing both qualitative and quantitative findings) to form categories. These categories were based on key findings and themes that emerged through the synthesizing process. Within these categories, broad and generalizable themes were developed. Figure 1 represents the process to form a theme.

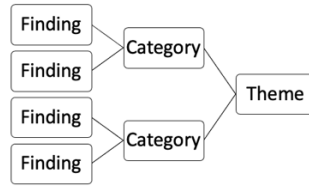


Figure 1: Thematic Analysis Process

Informed by the JBI SUMARI approach, the reviewers generated statements that were an aggregation of the themes created [24]. This final step resulted in domains that incorporate evidence from two or more themes to describe factors that impact the effectiveness of prosocial interventions.

We used the GRADE approach to assess the confidence of summary findings [25]. We first determined what the outcomes of interest were within the scope of this systematic review, and then grouped the studies accordingly based on their relevance to those outcomes. We then assessed the risk of bias, imprecision, inconsistency, indirectness, and any potential issues to determine the certainty of such evidence associated with these outcomes of interest.

## Results

The initial search yielded 7,053 citations. After removing 1,827 duplicates, there were 5,226 records to be screened. After the title and abstract screening, 408 full-text studies were assessed for eligibility. The majority of these studies were excluded because they were not prosocial interventions or were lacking a comparator group. Other reasons for exclusion included outcomes not related to health, not peer reviewed, and non-English. Ultimately, 29 studies were included in this literature review. Figure 2 represents the breakdown of screening and study inclusion through a PRISMA Diagram.

Table 1 summarizes the characteristics of the studies on this review. A full summary of each study can be found in Appendix 1.3. 17 of the studies focused on individual recipients of

the prosocial intervention, while 12 studies aimed at improving the health of groups or populations. The majority (59%) of studies analyzed mental health and well-being as the primary health outcome. Others looked at disease screening, public health, physical activity, and biomarkers. Almost all studies were conducted in middle- or high-income countries.

We identified 12 categories which were then synthesized into five themes: ‘community and connection’, ‘external influences affecting health outcomes’, ‘individual interest’, ‘internal drive’, and ‘emotional expression’ (Appendix 1.4). These five themes were then further aggregated into two domains: individual factors and interpersonal and contextual factors that affect the successful implementation of prosocial interventions. These are reflected in our results section and focus on the broader impact of prosocial interventions on health outcomes.

#### Individual factors impacting the effect of prosocial interventions

A total of six studies examined the impact of individual factors in moderating the effect of prosocial interventions [3, 26-30]. One study noted that illness in the giver affected their capacity to help others [26]. The baseline health of an individual can also impact their ability to benefit from a prosocial intervention. In one study specifically, the researchers focused on whether expressive helping towards others could improve general distress among cancer survivors. The researchers found that expressive helping did not improve the general distress of participants in the low survivorship problems group and indicated that this could be due to the fact that there was little room for improvement in this group as they were already experiencing lower distress [26]. In contrast, a study exploring the individual factors and sociodemographic characteristics associated with test uptake in pay-it-forward interventions found that people with higher incomes were not more likely to receive testing than participants with lower incomes [3].



The review also identified two studies that illustrated the impact that self-interest had in decisions to engage in prosocial behaviors [28, 29]. Both studies noted that participants who received monetary incentives for themselves for a specific behavior experienced the same improvement in health outcomes as those whose action results in a donation to a charity of their choice [28, 29].

#### Interpersonal and contextual factors enhancing the effect of prosocial interventions

In a prosocial interaction, the relationship between the giver and recipient can be influential in the success of achieving a desired health or medical outcome. Our review highlighted several interpersonal and contextual factors that impacted the effectiveness of prosocial interventions. A total of 13 studies found that interpersonal and contextual factors facilitated prosocial interventions [2, 3, 30-40]. Such interpersonal and contextual factors were operationalized by the studies through either (i) the giver's relationship to the recipient of the intervention, (ii) the recipient's response to the prosocial intervention, (iii) a broader connection to a community, or (iv) the policy or community culture or environment.

Among these 13 studies, three studies found that the preexisting relationship with the recipient had an impact on the effectiveness of a prosocial intervention [35, 37, 38]. For example, in one study, participants indicated their preference to perform their act of kindness on friends or family members compared to strangers, so they could see the impact [37]. In addition, three studies found that the reaction of the recipient in response to the prosocial intervention had varying effects on health outcomes for the giver of such interventions [34, 36, 37]. A study focusing on acts of kindness found that positive reactions towards the participants enhanced the effect [34].

In the five pay-it-forward studies, the interventions were developed using co-creation, and this enhanced community participation in the development, implementation, and uptake of these interventions [2, 3, 31, 39, 40]. Co-creation is the process of gathering input from community members prior to implementation [31]. Qualitative finding from the mixed methods study on pay-it-forward gonorrhea and chlamydia testing among men who have sex with men also found that the intervention enhanced community identity among sexual minorities, as well as their desire to help the community. The pay-it-forward intervention gave participants a platform to create a sense of belonging, and a chance to help others within their own community.

Finally, seven studies noted that the condition in which the prosocial intervention took place had an impact [13, 27, 30, 40-43]. For example, a study focusing on prosocial behaviors in children found that school policy and community culture were important factors that impacted the outcomes of the intervention [41]. Another study found that peer charity was effective in improving self-esteem and reducing depression among left-behind children. However, this study concluded that charity donations may be less threatening in a society where charity is considered common compared to other societies [43].

#### Types of studies

We identified five types of prosocial interventions. From the 29 studies included ten studies involved acts of kindness towards others. Five studies focused on prosocial behavior through the expression of kindness. Acts of kindness and expressions of kindness differed in the extent to which participants were asked to take a deliberate act of kindness (beyond writing or expressing one's kindness). Four studies involved paying-it-forward. In pay-it-forward, a person received a gift from someone else, a community group, clinic, or government, and were then given the opportunity to give a gift to another person [44]. Three studies involved charitable

donations resulting from participant activity, while two studies involved prosocial spending on others. Thirteen studies incorporated prosocial behavior towards an individual, while 11 were directed towards a group or population. The full GRADE assessment can be found in Appendix 1.5.

Acts of kindness (n=12) may improve health outcomes based on a low certainty of evidence. In this review, an act of kindness was defined as an action that benefits someone else, potentially at the expense of the individual performing the act. While several studies found a positive impact of acts of kindness on health outcomes (n=8), some interventions led to no statistically significant differences (n=3), or negative outcomes in the intervention group (n=1).

Expressions of kindness were effective in improving health outcomes (n=5), with moderate certainty of evidence. In this review, we included studies that used expressions of kindness intended to improve the health others. This did not include studies that incorporated expressions of gratitude. Previous studies have focused on the health impact of expressions (gratitude, spirituality) on wellbeing and found a positive relationship [45, 46]. One overall finding was that kindness expressions (expressive helping or writing) was an influential variable in several of the studies, affecting the success of the prosocial intervention.

The incorporation of paying-it-forward (n=5) to improve health outcomes had a moderate certainty of evidence. For pay-it-forward studies, the evidence shows that paying-it-forward led to an increase in test uptake for gonorrhoea and chlamydia in men who have sex with men, as well as vaccine uptake for influenza among children and older adults in China [2, 3, 31, 39, 40]. These included a mix of quasi- and randomized-controlled experimental designs, and a mixed methods analysis that further strengthened the findings of the approach. Incorporating prosocial spending (n=4) in prosocial interventions to improve health outcomes had a moderate certainty

of evidence, given that prosocial spending led to increases in happiness and subjective well-being in spite of the smaller number of studies [30, 43, 47, 48].

#### Overall effectiveness of prosocial interventions in improving health outcomes

Overall, our review identified 24 studies which showed prosocial interventions led to improvements in health outcomes [3, 26, 28-36, 38-43, 47-53], and five studies had no conclusive findings [13, 27, 37, 54, 55]. Results also differed depending on whether the public health benefit was towards the giver or receiver of the prosocial action. A total of 24 studies examined the impact of such interventions on the givers themselves [13, 26-30, 32-34, 36-38, 41, 47-55], of which 17 found a positive impact [26, 28-30, 32-34, 36, 38, 41, 47-53] and five found no impact [13, 27, 37, 54, 55]. In contrast, a total of seven studies also examined the impact of prosocial interventions on the recipients or public health benefit of such interventions [3, 31, 35, 39, 40, 42, 43], all of which found a positive impact [3, 31, 35, 39, 40, 42, 43].

Prosocial interventions also had the potential to positively impact community connectedness among participants. Community connectedness is the individual feeling of belonging towards a specific group. A total of six studies found that participating in prosocial intervention led to a strengthening of one's connection to another individual or a community [31-34, 40, 55]. For example, in the pay-it-forward model, participants indicated that in addition to the free gonorrhoea or chlamydia test they were receiving, they also felt cared for by others in their community [31].

#### Discussion

This systematic review used meta-aggregation techniques to develop themes and domains that described the overall effectiveness of prosocial interventions, alongside how individual, interpersonal, and contextual factors as well as the nature of the interventions themselves can

impact the effectiveness of such interventions on health outcomes. Prosocial interventions have the ability to positively impact health and medical outcomes. Individual interests and community connectedness are vital aspects of prosocial interventions, and it is important to consider that there are many different types of prosocial interventions. This study extends the literature by focusing on prosocial interventions, using the GRADE method, and including both qualitative and quantitative data.

We found that most studies indicated that prosocial interventions generated positive health outcomes for givers and recipients. This theme aligns with the current body of literature focusing on prosocial interventions and health outcomes. We believe that prosocial interventions can affect health outcomes due to the connected nature of humans and our willingness to help each other [56]. This was especially apparent during the COVID-19 pandemic, when initiatives around the world were put in place to help others out, and many individuals participated [56]. Three studies in this review focused on prosocial behavior during the COVID-19 pandemic [13, 30, 39], and one paper acknowledged the impact that the pandemic had on the outcome of the study [43].

Despite the focus of prosocial behavior, individual factors can influence the effectiveness of these interventions. Individual interests remained an impactful variable in several of the studies. Previous studies have analyzed the self-interest of individuals in relationship to prosocial actions [57]. By definition, prosocial behavior does not need to be conducted solely for the purpose of others, it can be either altruistic or egoistic [10]. Future researchers can consider an individual's propensity to act in self-interest and emphasize the benefit to the individual in addition to that of the recipient.

Our data suggest that community connectedness facilitated prosocial interventions. Previous research has found that connection to the recipient can influence prosocial behavior [58]. Connection can result from shared interests and also shared vulnerabilities [59]. One study used community connectedness as a mechanism to increase prosocial behavior [60]. The connection that people feel towards others as individuals or a community plays a role in their prosocial behavior. Tying in a connection to the recipient and community support can effectively improve the likelihood improving a desired health or medical outcome using a prosocial intervention.

The differentiation of prosocial intervention exists on a continuum of different types of prosocial interventions fit into this review. Prosocial is a loosely defined term in the literature, and we sought to incorporate a variety of interventions and subsequently break down the constructs into categories.

Our data have implications for research and policy. Additional research to develop a theory of prosocial interventions may facilitate implementation. Prosocial interventions may provide an opportunity to strengthen within-group ties and share vulnerability. This will provide opportunities for future studies to focus on specific categories and develop an even deeper understanding of the health implications. Policy makers can use the findings of this review to develop a deeper understanding of prosocial behavior and develop policies and programming that incorporate community connection and individual interest to maximize potential benefit.

Our review has several limitations. First, we excluded non-English language studies. However, several systematic reviews have suggested that this does not impact the overall study findings [61, 62]. Second, we excluded studies without a comparator. There may be important single-arm studies that demonstrate the feasibility and acceptability of prosocial interventions.

However, these study designs are less robust and limit the researchers' ability to discern whether any impact resulted from the intervention. A third limitation is that we did not pool the results due to heterogeneity. This decision was made because the outcomes were too heterogeneous. There is a body of literature indicating that researchers should hesitate to pool when there are similar constructs and/or heterogeneity [63, 64].

## Conclusion

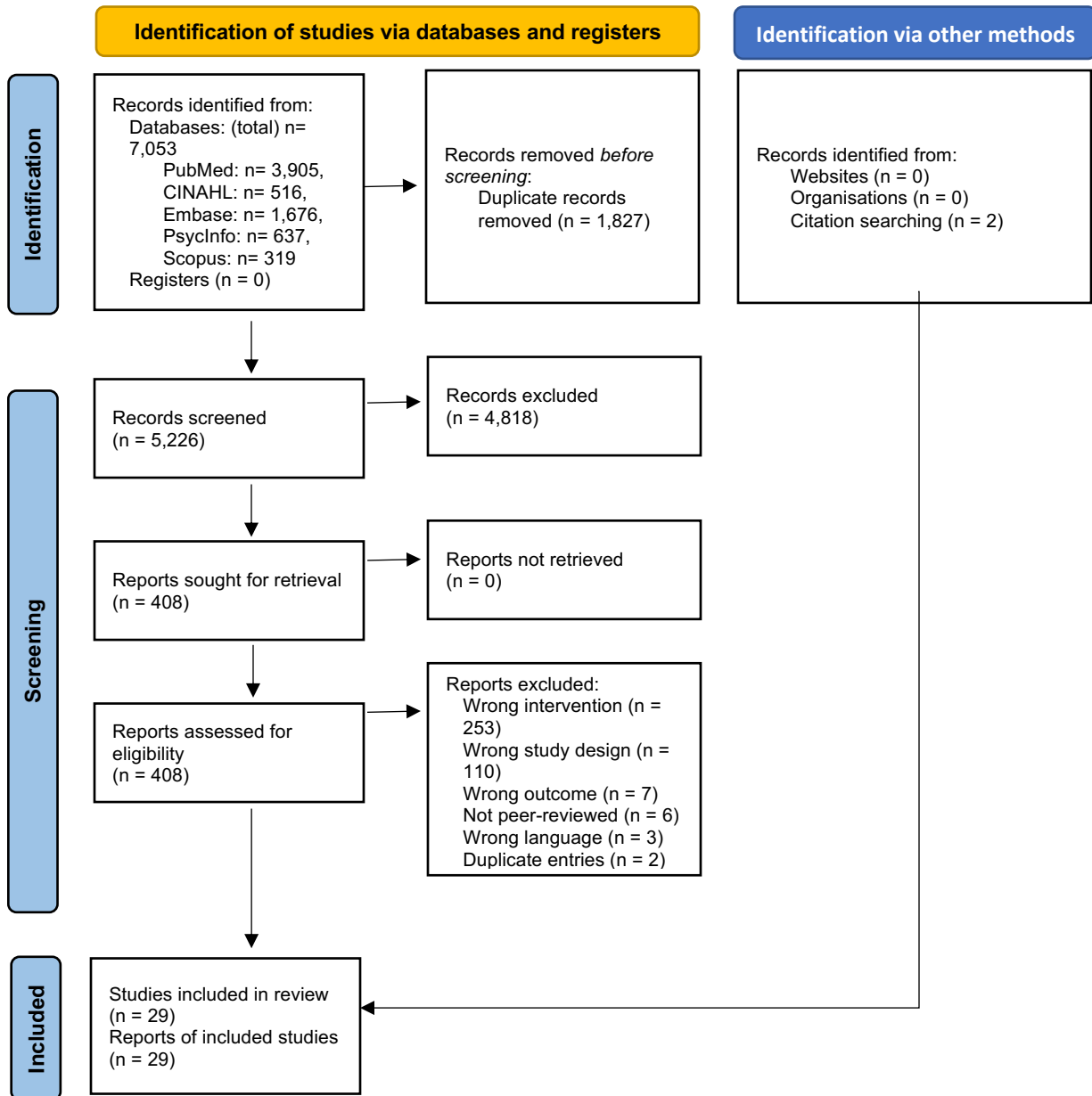
The findings from this systematic review can inform research. Overall, researchers can consider the components that did or did not lead to health improvements within the studies, and incorporate facilitating variables, while deliberately thinking through variables that have been a barrier in the literature. This literature review illuminated the various mechanisms by which prosocial interventions focused on improving health or medical outcomes can work. Through a meta-aggregation process, we were able to develop themes that provide insight into how the prosocial interventions in this literature review functioned and provide insight for future research opportunities. When considering prosocial interventions, researchers should give thought to the community connection, contextual influences, individual interest, scale-up and social effects, internal drive, and emotional expression. While these themes are not exhaustive, we believe careful consideration of these variables and mechanisms can influence future prosocial interventions focused on improving health or medical outcomes. Further research can refine these mechanisms and provide clear pathways by which they influence the outcome of an intervention.

Table 1: Summary of study characteristics

Characteristic	N=29	%
Nature of prosocial intervention		
Acts of kindness	12	41.4
Expressions of kindness	5	17.2
Paying-it-forward	5	17.2
Charitable donations for participation	3	10.3
Prosocial spending on others	4	13.8
Recipients of prosocial intervention		
Individuals	17	58.6
Groups or populations	12	41.4
Health outcomes of prosocial interventions		
Mental health and well-being	17	58.6
Disease screening	4	13.8
General public health	3	10.3
Physical activity	2	6.9
Individual biomarkers	3	10.3
Countries of studies		
United States	9	31.0
China	7	24.1
Canada	4	13.8
The Netherlands	4	13.8
Japan	1	3.4
Hong Kong	1	3.4
Colombia and Chile	1	3.4
Global	2	6.9
Study Design		
Randomized controlled trial	18	62.1
Quasi-experimental	3	10.3
Experimental	5	17.2
Mixed methods	3	10.3



Figure 2: PRISMA Diagram



## **CHAPTER 3: HOW PAY-IT-FORWARD WORKS: A QUALITATIVE THEMATIC ANALYSIS OF THE OF THE PARTICIPANT EXPERIENCE**

### **Introduction**

Gonorrhea and chlamydia are common sexually transmitted disease (STD) among gay, bisexual, and men who have sex with men (GBMSM) in China [65]. The US CDC recommends all sexually active men who have sex with men receive annual testing for gonorrhea and chlamydia because many cases are asymptomatic [66, 67]. However, testing rates are insufficient among GBMSM in China [7].

Financial and social incentives can be an effective way to impact health behavior. One systematic review found that studies who offered incentives for STD testing found an increase in rates of testing [68]. A systematic review in high income countries found that incentives to increase sexually transmitted disease screening were most effective when they were specifically designed for the target population and setting [69].

One potential way to increase gonorrhea and chlamydia testing is pay-it-forward. The pay-it-forward approach includes offering an individual a gift (e.g., an STD test) and then asking if that individual would like to give a gift (e.g., donation or message) to another person [2]. A randomized controlled trial demonstrated the preliminary effectiveness of a pay-it-forward approach aimed at increasing gonorrhea and chlamydia testing among GBMSM in China [2]. However, the experience of the participants in the pay-it-forward approach is not fully

understood. It is important to understand how this experience to enable future implementation of this strategy and leverage pro-social interventions to encourage participation.

In 1990, James Andreoni introduced the concept of warm glow in reference to impure altruism [70]. The giver is considering both their contribution to public good and the “warm glow” they feel as they give. An individual who cares only about giving the gift is considered purely altruistic, while an individual who considers only their own warm glow is purely egoistic [70]. According to J. Atsu Amegashie (2006), gratitude and warm glow are connected [71]. He concludes that warm glow feelings exist because “donors derive utility from the act of giving per se because their beneficiaries derive utility from the act of receiving per se [71].” Little work has been done to fully understand the role of gratitude and warm glow feeling work in public health settings. However, previous pay-it-forward studies have found that participants indicating a feeling of warm glow resulting from helping others [3].

Qualitative methods are often not used to analyze behavioral interventions but can be useful in understanding the intervention. As we learn about the experience of the participants, we will gain clarity around their behaviors and choices. A deeper understanding of the participant experience will enable researchers to consider the important factors of implementation when utilizing the pay-it-forward approach in other regional, population, or health outcome areas.

This study aims to qualitatively understand the participant experience when they receive a gift and the warm glow feeling that people feel when they give to others. In this study, implementation strategies were tested at an MSM-led and STD clinic in Guangzhou, China. The participants received standard pay-it-forward. This study analyzed the feelings of participants in the pay-it-forward model. We sought to develop an understanding of the barriers and facilitators to the successful implementation of pay-it-forward from the perspective of the participant. The

goal of this study is to conceptualize the feelings that individuals experience in this pay-it-forward approach.

## Methods

### Design

This qualitative study uses interviews to examine the extent to which gratitude and connectedness play a role in the pay-it-forward approach. We were seeking to understand how participants feel and what factors motivated their decision to make a donation. The responses were analyzed to thematically describe the lived experience of participants. We used the information gathered to operationalize whether and how the gratitude felt was a result of the pay-it-forward model. Participants were given an informed consent form prior to participation.

### Sampling

Semi-structured interviews were conducted at two different STD testing sites in Guangzhou, China. The MSM clinic and free STD clinic were located in the same facility. The MSM clinic was on weekends and the STD clinic was on weekdays. Both clinics provide STD testing to their patients. Participants who entered the clinic and fulfilled the inclusion criteria were recruited to participate in this study. The inclusion criteria for participation in this study included men who had anal sex with another man; were at least 18 years old; have had anal sex over the past year; had not been tested for gonorrhea in the past year; resided in the city in the past three months; spoke Mandarin Chinese or Cantonese; were mentally capable to provide informed consent to test for gonorrhea; and owned a mobile phone. In China, over 90% of GBMSM own a mobile phone. All men who entered the clinic and met the inclusion criteria were invited to participate. The participants were given a post card written by the individual who

paid for their test. They were also given the opportunity to write a post card for the next participant.

### Key domains

The key domains for this study predominately focus on the experience of the recipient and giver. The questions asked about the participant's feelings immediately after receiving the gift, level of gratitude, and reasons for participation. To understand the LGBTQI community through the perspective of the participants in this study, we asked about their connection to the community and their definition of the LGBTQI community. The questions were largely open ended. The interview guide can be found in Appendix 2.1.

### Data collection

Recruitment lasted from May 22, 2022 until July 31, 2022. On average, recruitment occurred at the public STD clinic three times a week, and two times a week at the MSM led clinic. Participants were interviewed by a member of the research team after they completed their STD testing. Interviews were conducted online using audio and lasted 40-60 minutes.

### Analytical Approach

After administering the interviews, the responses were translated verbatim. Working as a team, a coding framework was developed based on the questions and responses we were receiving. Each interview was coded by a single team member. We conducted a theoretical thematic analysis to form overall themes and overarching factors from the two clinics. The analysis was guided by Bruan and Clarke [72] and followed the process of inductive thematic analysis. The themes were developed from reviewing all interviews, and do not represent the feelings and insight of any one individual exclusively. Prior to finalizing the themes, we identified four levels of implementation that we were interested in focusing on: before

participation, PIF impression, receiving and/or writing the postcard, decision to pay it forward. These levels were guided by the conceptual model of the pay-it-forward approach [44]. The themes were then determined within these four levels.

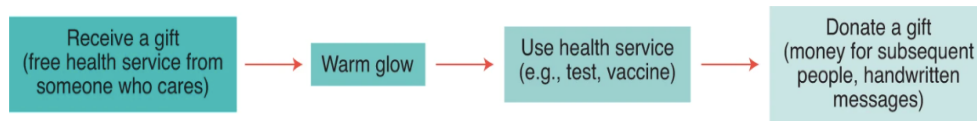


Figure 3: Overview of the pay-it-forward approach

## Results

This study included 24 participants at two different sites. Twenty (83.3%) were recruited from an MSM Sunday clinic and four (16.7%) men were recruited from a free STD clinic in Guangzhou.

The average age of the participants was 24 years old. The youngest participant was 20 while the oldest was 49. 16 (67%) of the participants had a bachelor's degree, while 2 (8%) had middle or high/vocational school, and 6 (25%) had above a bachelor's degree. Almost all (92%) of the participants were never married. When asked how open or out they were as a gay, bisexual, or a man attracted to other men, 7 (29%) indicated a little bit out and 8 (33%) indicated somewhat out. 6 people (25%) responded that they were not at all out and 3 people (13%) indicated that they were very much or completely out.

Using inductive thematic analysis, we observed 1-2 themes at each level of implementation (before participation, PIF impression, receiving and/or writing the postcard, decision to pay it forward). We have included translated quotes and excerpts from our interviews. Table 2 provides additional quote excerpts in support of the themes described below.

## Concern over test results

While some participants indicated that the STD testing is routine and that they were not too concerned, many (n=15) discussed the fear and anxiety they felt when waiting for STD testing results. When one participant (age 20-24) was asked how he was feeling entering the clinic, he stated “I was a little worried, I was a little scared after all.” Many participants used worried, anxious, and nervous to describe their feelings around STD testing and entering the clinic. Several participants indicated that they knew quite a bit about STDs because of the importance and relevance in their community. One man (age 20-24) who was particularly knowledgeable about STDs and STD testing said that “I actually look up this knowledge on my own, just whether it's caring for myself, caring for my friends, or educating myself.” Many others stated that they receive testing after engaging in risky sexual behavior.

## Detachment from LGBTQI Community

18 PIF participants noted a detachment from the LGBTQI community prior to participation. We found that participants acknowledged the existence of a “gay community,” but maintained a level of detachment from this community for a variety of reasons.

A theme that developed regarding gay community was that the definition included the entire population of people who identified as LGBTQI. These participants did not indicate a strong gay community, but rather a general definition of who was included. One participant (age 25-29) stated that “I think it's just kind of broad, like all of the gay, lesbian, bisexual and LGBT people in a country, for example.” Many participants used a variation of this general definition of a LGBTQI community. When asked about their own connection to the gay community, participants often indicated a weak connection. Participants mentioned having a few friends or acquaintances but did not indicate a larger connection beyond that.

This detachment was largely attributed to the internal and external stigma that participants felt from being a member of the gay community. One participant (age 25-29) described his definition and connection to the gay community by stating “Probably because we all share the same sexual orientation, which is a minority group, so we will gather together to help each other. But I've done your online survey before, and I don't really want to be labeled or stereotyped. So I don't usually participate too much in these circle activities, I will only filter and participate if I think it will help me.” Additionally, some participants felt that their connection to the LGBTQI community could negatively influence them later due to this stigma. Participants pointed out that the social and political context in China makes it difficult to have a gay community because of the legality issues.

Although most participants reported feeling detached from the community, some participants indicated a close connection to the gay community. Specifically, some cited common interests and the ability to talk freely as a reason for this close connection. One participant (age 20-24) said “I think this cohesion is reflected in the individuals, that is, they will share some common topics. Maybe these are topics that you may not be able to talk about in the outside world, that is, in the larger social environment, such as some of the gay-related ones.” For this group that indicated a close connection, some were able to open up and speak freely about sexuality and other GBMSM specific topics and feel understood by their community. This minority of participants felt a connection to the gay community because they felt they had a group of people who understood their experiences. Unlike the participants who did not necessarily want to associate with or be labeled as part of the LGBTQI community, these participants found benefits to this group association. While there were fewer individuals in this



sample discussing this close connection, it is important to acknowledge that some participants did feel like they were a part of the gay community prior to engaging in this study.

Unspecified gratitude for the focus on the health needs of the LGBTQI community

13 GBMSM in the pay-it-forward study remarked on the theme of receiving pay-it-forward and experiencing unspecified gratitude. The third theme that emerged in this analysis dives into the emotions of the participants after the idea of pay-it-forward was introduced. To understand the role that gratitude played in the emotional experience of the participants, we asked specifically about whether they felt gratitude. A theme that emerged was that participants felt unspecified gratitude, meaning they indicated feeling some level of gratitude, but were unclear when describing this feeling.

Several men reported that they were unsure if their feelings were gratitude or perhaps something else. Others described a feeling of warmth but did not specifically indicate gratitude. One participant (age 30-34) expressed the conflict he was having with the concept of gratitude when he stated “But when it comes to who to thank, I don't know if there is such an idea. Maybe I feel that there is gratitude in the moving. I am very grateful to some of your workers for their efforts or something. I think there should be. But when it comes to gratitude, the word may be used a bit strangely. If you are grateful, you may have to repay a little bit of your gratitude.” Participants also indicated a more general approach to gratitude identifying that they were happy to know that work was being done to benefit the LGBTQI community. One participant (age 45-49) stated that one thing he benefited from the program was that he learned that “some organizations, companies and schools are caring about this group.”

Generally, we found that participants didn't express gratitude to the person who paid it forward but instead for a more general awareness about the needs of the LGBTQI community.

While some participants did indicate they were thankful for the testing service, when probed regarding feelings of gratitude towards the research study team and LGBTQI community, the answers were less specific and clear, leading to this theme of unspecified gratitude.

Community connection enhanced through participation in pay-it-forward

13 pay-it-forward participants noted that pay-it-forward enhanced the connection between the GBMSM and the larger LGBTQI community. A fourth theme that emerged in this data is that the connection to others in pay-it-forward is an important component in the function of this method. This connection was mentioned in a variety of ways, but multiple participants indicated that receiving and/or writing the post card left them with warm feeling towards other individuals in the program.

When asked about receiving the post card, many participants said it made them feel good, a few even mentioned the post card made them tear up. One individual (age 20-24) expressed the positive emotions he experienced when he said “I thought it was very good, very warm, everyone was trying very hard, very positive, living in the sunshine. Even if I'm infected, I feel like I can live positively and sunny.” This sentiment emerged in several interviews and for many participants the post card induced warm emotions.

Some participants appreciate the opportunity to express themselves towards other members of the LGBTQI community. Due the detachment mentioned earlier, some men felt they do not always have this line of communication. One participant (age 20-24) dove into this concept, stating that “When you find a channel exists, the existence of the channel actually makes me feel that I am heard and cared for. The fact that "there is a channel for your thoughts" is more touching than the words we write, which can be expressed and seen.” Some participants

explicitly acknowledged that they do not participate in the gay community often, but the post card provided them the opportunity to do so.

Additionally, many men wanted to use the opportunity of writing the post card to encourage healthy behaviors and testing to others in their community. One participant (age 20-24) clearly stated this when he said “And then I would also write that testing for these two items actually helps protect your health and your partner's health, and I hope you can feel this goodwill and pass on this testing for this good cause.” When one participant in the free test group was asked about pay-it-forward in a hypothetical way, he acknowledged that this method could lead to a deeper community connection and support. The post card provided the opportunity for participants to feel a sense of connection to one another and share wisdom and advice.

#### Social Responsibility and/or Altruism

14 pay-it-forward participants felt a sense of social responsibility and/or altruism. A final theme that emerged in this qualitative analysis is the concept of social responsibility and altruism. In this theme we explore the way in which several men felt they were participating and choosing to donate because it was the right thing to do.

Some participants felt that they did not choose to act and donate from an emotional response, but rather because they appreciated the work that was being done by the project and wanted it to keep going. One participant (age 30-34) said “I didn't have any feelings in my heart. At that time, I didn't think too much about it, because I donated in the hope that this mechanism can be maintained, so I didn't think that my donation would go to the next specific person, I didn't think that I would be happy to help others individually. I simply thought the project was good, and I felt that I had benefited from it, so I wanted it to continue, so I donated.” Other participants said that they didn't experience any specific emotions but wanted to donate to ensure

that others could receive a free test. These men are stating that they did not feel any emotions, but it is clear from their responses that there is a feeling of obligation to donate and continue this program.

Some men were more explicit that they were choosing to donate to follow along with the pay-it-forward approach and help others that will participate in this program. A participant (age 20-24) described his willingness to participate and make a donation when he said, “Because of the relay inspection of love, I am willing to give a little of my love and make some contributions to the next person, even if it is a little bit, I think I will feel very happy, or I am willing to do these things for him.” Other participants indicated that they were able to help others, so they did. Because they were able to, these men were willing to donate and subsequently keep the pay-it-forward approach functioning.

Figure 4 displays the emotional process of pay-it-forward based on the themes described. The white boxes indicate our understanding of the pay-it-forward process prior to this study. The yellow boxes represent the themes above and are added to show the full experience of participating in pay-it-forward.

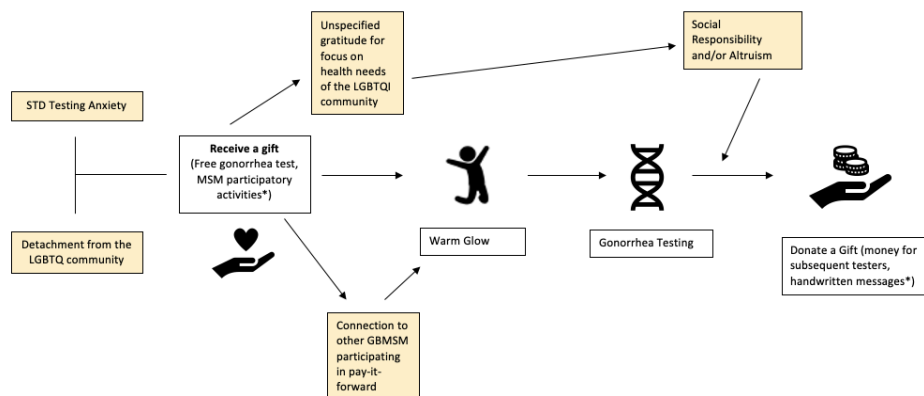


Figure 4: Overview of the pay-it-forward process from the participant perspective

## Discussion

This qualitative analysis used inductive thematic analysis to generate five themes that provide insight into the participant experience in pay-it-forward. The main themes that we developed from this analysis were testing anxiety, detachment from the LGBTQI community, unspecified gratitude, connection to the recipient, and social responsibility and/or altruism to pay-it-forward. These themes contribute to the current body of literature focused on incentivizing STD testing because we have developed a greater understanding of the experience, needs, and influences of the participants in this pay-it-forward study. After our thematic analysis of the qualitative interviews, we discovered that a critical component to increasing STD testing rates among the study participants was the increased focus on providing health resources and community connection. These findings suggest that solidarity towards better health services for sexual minority men, as modeled in the pay-it-forward model, lead to community building and improved health screening.

The community connection between the participant and larger LGBTQI community emerged as important across multiple themes in this analysis. Previous studies have found that community engagement and leadership among GBMSM have facilitated STD testing [73]. Additionally, prosocial literature indicates that the health impact of a pro-social intervention is stronger when the participant and giver have a strong tie [38]. Participants indicated that the connection they felt to a community resulting from participation in this study created feelings of warmth. This warm feeling suggests the importance of building a network for sexual minority men in China. While many participants were slightly removed from the community prior to participation, they did experience feeling part of a larger community because of this project. In addition to the connection participants felt to the LGBTQI community as a whole, many

participants also indicated they felt a connection to other individuals in the project. When asked about the postcard they received, many participants said that they appreciated the post card to share their love with other individuals in the study. Participation in the pay-it-forward model provided these men the opportunity to connect to the LGBTQI community in ways that they may not have otherwise. This finding has implications for future research and implementation of the pay-it-forward approach. Researchers should consider emphasizing the community connection component of the pay-it-forward approach to maximize potential health benefits.

As a result of participating in this study, many individuals felt cared for. Previous pro-social studies have found that the overall atmosphere of kindness and care can have a positive impact on the participants [27, 41]. Research shows that GBMSM may avoid seeking health treatment in China due to fear of stigma or discrimination based on sexual behavior [74]. To combat this, it is important to understand how a project can make GBMSM feel they will not be discriminated against while seeking medical care. A participant noted (age 20-24) that “You may feel a little disappointed and like a product on the assembly line being investigated. This time (relay test), I feel as if I am really allowed to participate in it in my own individual way, and then there is an interaction and a higher degree of participation.” The pay-it-forward approach made participants feel cared for and provided a place for this sexual minority to receive health services free of stigma or discrimination. Policy makers focusing on creating policy to impact marginalized population should consider the impact of this feeling on their population of interest. Policy makers can improve health outcomes for a marginalized population by resisting discrimination and prejudice, while emphasizing the importance of the health of these individuals.

Based on the themes emerged from this thematic analysis, community connection and efforts towards improved health services for sexual minority men are vital in the function of the pay-it-forward model's effort in increase STD testing rates among GBMSM in China. It is important for future implementation of the pay-it-forward model to emphasize the community component. When asked about future implementation, many men agreed that identifying the recipient of their donation as a specific friend or relative would increase their participation. Future researchers implementing the pay-it-forward approach should continue to find ways to creatively incorporate and emphasize community connection. Additionally, policy makers who aim to improve the health of sexual minority men should continue to ensure the population of interest is aware of and included in the implementation of these efforts.

#### Strengths and Limitations

One strength of this is the high level of detail we received in the answers of the participants. We achieved this through field testing the questions prior to beginning the study to ensure that they were understandable and provided an opportunity for participants to express themselves. The participants were given the opportunity to share as much information as they wanted through semi-structured interviews conducted by a skilled interviewer.

There were also limitations to this study. One limitation is that the interviews were conducted online days after participation in the study. Feelings could have been forgotten by participants in the time that passed. However, the detailed and field-tested interview questions were designed with this in mind, and follow-up questions were used to encourage participants to think back to their participation.

## Conclusion

Based on this thematic analysis, we conclude that the pay-it-forward model highlights the need for connection, support, and health services for gay men in China. Pay-it-forward is a promising approach to increasing rates of STD testing, and this qualitative analysis provides a deeper understand for how participation affected these men.



Table 2: Supporting Excerpts for Themes

Theme	Example Supporting Quote	Participant
Worry about STD testing	“I was a little bit worried that I had it.”	Age 20-24
Detachment from the LGBTQI community	“Well, actually I'm not too much in this community, it's just that there are some people around me that I know, and they might organize some people to go to karaoke, to eat, to play, but I don't go like this, and that's about it.”	Age 20-24
	“I even sometimes feel that if something goes wrong, I'll worry that it will lead to discrimination against us as a sexual minority.... so I try to have less contact. It's good to keep some distance.”	Age 25-29
	“I think this society is suppressing this community, that's all I think.”	Age 20-24
Unspecified Gratitude	“At that time, I was thinking that there were some people behind me who were working hard, so I felt warmer and less lonely because I was not alone. I felt that I had a place to go, a place to return to, just like that.”	Age 20-24
	“There would be a warm feeling, but saying gratitude would be general. I don't really understand what gratitude means, that is, who should I be grateful to? Should I be grateful to the people who helped me with the test, or the people who organized the project, or the people who donated money? I don't think I'm particularly grateful for participating in this project.”	Age 20-24
Connection to the recipient	“The majority of people actually keep their distance from strangers, but you can express yourself through a text, so that you can write some words of encouragement to the other person.”	Age 25-29
	“It may not be as easy for people to get in touch with some friends or groups that have a common identity with them, so this is equivalent to giving people a kind of support and support, so that they feel that they are not very, just not alone.”	Age 25-29
Social responsibility and/or altruism	“To be honest, I don't feel any gratitude or warmth... I will feel I am using some of my actions to create a little bit of funding for Zhitong and they may be able to give more people a free test.”	Age 30-34
	“I personally think that I can support them... If I have the ability, I can donate it.”	Age 30-34

## **CHAPTER 4: THE INTERNAL EXPERIENCE OF THE PAY-IT-FORWARD APPROACH: THE ASSOCIATION BETWEEN PARTICIPATION AND GRATITUDE, WARM GLOW, AND OXYTOCIN**

### Introduction

The pay-it-forward approach is a novel and sustainable approach that has shown promise in increasing STD testing among participants in China and has the potential for implementation in new settings. In 2022, a pilot study was conducted that built on a 2018-2019 randomized control trial that examined the effectiveness of a pay-it-forward approach aimed at increasing gonorrhea and chlamydia testing among gay, bisexual, and men who have sex with men (GBMSM) in China [65]. The pay-it-forward approach in the context of STD testing incorporates a participant receiving the gift of a free STD test, and then being asked if they would like to pass this gift on. The initial trial found that pay-it-forward can increase rates of gonorrhea and chlamydia testing among MSM in China [65]. How model works is not fully understood. Researchers have hypothesized that warm glow, the emotional reward associated with giving, could be a factor [70]. The warm glow literature focuses primarily on the feeling an individual gets when they give to others, but we are interested in the intersection between receiving and giving. Additionally, several studies have credited warm glow for specific behaviors, but do not actively measure it. Jeffrey Carpenter (2018) went on to ask participants of a study whether warm glow was a primary motivation for giving when asked, but this study does not (a) measure the warm glow or, (b) focus on feelings of the recipient [75]. The findings of this

study will have implications for prosocial public health interventions in which a gift is given to a person and then the same person can give to support others.

Gratitude is an undeveloped aspect of the discussion of warm glow in the literature that relates to impure altruism. In the literature focusing on warm glow, researchers focus on the feeling one experiences when they give to others. This impure altruism gives the giver a feeling of warmth as he or she is helping others [70]. Many studies point to warm glow as a reason for altruistic behavior. Studies have been conducted using warm glow to explain the behavior of donating blood [76], volunteering [77], and charitable giving [78]. We sought to further understand the gratitude and internal component of pay-it-forward and how that is related to prosocial and altruistic behaviors. In our study, the individual in question is asked to give only after he has received a gift. This is different from previous literature on warm glow. This study will further our knowledge of gratitude and warm glow and provide insight into the mechanisms of the pay-it-forward model.

Oxytocin is an objective measure that can be used to measure the impact of the pay-it-forward model on participants. In some instances, individuals offer to give a gift after receiving, simply because they feel obligated [71]. We hypothesize that those who receive a gift are more likely to give because of the gift they received and the gratitude they feel. We believe that the mechanism for this interaction is the feeling of gratitude, which we intend to measure using oxytocin. Gratitude alone is a subjective measure, that is measured with potentially biased indicators. Oxytocin is a hormone in the body that is often associated with reproduction and love [9]. More recently, studies have begun associating oxytocin with socialization and stress relief [79]. Additionally, studies indicate that certain behaviors, such as interacting with a dog, can trigger a hormonal response and increase oxytocin levels [79]. One research study found that

oxytocin increased with feelings of gratitude towards one's partner [80]. We will build on this study to determine whether this increase in oxytocin applies when the gratitude is directed at a stranger rather than a partner. This study will focus on whether participation in the pay-it-forward model is associated with increased oxytocin levels.

Recently, we conducted a systematic literature review focusing on prosocial interventions and their effect on health or medical outcomes. This systematic review found that individual interests and community connectedness are vital aspects of prosocial interventions. Informed by the systematic review, the qualitative analysis from the pilot study found that the pay-it-forward approach highlights the need for connection, support, and health services for gay men in China. In this study, using quantitative data from the same pilot study, we sought to understand further the effects of the pay-it-forward model on individuals. Specifically, we wanted to understand whether receiving a gift as part of pay-it-forward is associated with transient feelings of gratitude and changes in oxytocin levels.

Using the data from this pilot study, we set out to further understand gratitude and warm glow through oxytocin levels, and the role they play in pay-it-forward. Future researchers can use these findings to utilize this pay-it-forward approach. Our goal was to understand the motivation and measurement of the biomarker oxytocin in the pay-it-forward approach to effectively inform future implementation.

## Methods

### Design and setting

This study was conducted at two clinics in Guangzhou, China. The research team at the clinics involved in this study have worked in partnership with SESH (Social Entrepreneurship to Spur Health) supporting GBMSM (gay, bisexual, and men who have sex with men) engagement

for many years. The SESH project is a collaboration between the Dermatology Hospital of Southern Medical University and the University of North Carolina.

This is a two-arm study comparing the pay-it-forward approach to a free test. In the pay-it-forward arm, participants were offered a free test, told an GBMSM in their community had donated the money to pay for that test, and given post cards written by community members who had donated. After this process, participants were asked if they wanted to donate the money for another MSM in their community to receive a gifted test. In the free test arm, participants were offered a free test and told this test was funded by a research study.

The two clinics involved were an MSM-led clinic and a public STD clinic. The MSM clinic runs on weekends and provides free syphilis and HIV testing by volunteers. The public STD clinic runs on weekdays in the same department, and men are referred here by clinic staff. Participants who visited the MSM clinic on weekends were assigned to the pay-it-forward arm, and participants who visited the public STD clinic on weekdays were assigned to the free test arm. All men who visited the clinics were assessed for eligibility and willingness to participate. The inclusion criteria for participation in this study include men who had anal sex with another man; are at least 18 years old; have had anal sex over the past year; have not been tested for gonorrhea in the past year; reside in the city in the past three months; speak Mandarin Chinese or Cantonese; are mentally capable to provide informed consent to test for gonorrhea; and own a mobile phone. In China, over 90% of MSM own a mobile phone. If a participant agreed to participate, he was given an informed consent form and description of the research study.

#### Data Collection

The data for this study were collected between May 22<sup>nd</sup> and August 7<sup>th</sup> 2022. The data collection consisted of one survey, two salivary oxytocin measurements, and one semi-structured

interview. The data were collected at three data points: entry, right after the introduction of the reason they are receiving a free test, and later for a semi-structured interview. Upon entry, the participants were given a survey to fill out that contained sociodemographic information, personal identify information, and baseline gratitude. Participants were also administered their first saliva swab. Immediately after the description of the test (PIF or free test), participants were administered their second saliva swab. The timing of this process was determined through field testing with GBMSM in China. The peak levels in the field test were immediately after the participants were exposed to a heartwarming video. Oxytocin was measured using Human Salivary Oxytocin Elisa kit. We measured oxytocin at arrival because this hormone level may vary from one person to the next and we were interested in the change of this level within an individual. That being said, the normal range of oxytocin is 1–4 pmol/L [81]. The subsequent interview repeated the gratitude questions to determine whether gratitude increased due to the free test and also asked additional questions inquiring about the participant’s experience with PIF or the free test.

### Key Measures

The main variable of interest in this aim is oxytocin measurement. These variables were measured on a Likert scale using previously validated survey questions. To gauge an understanding of the participant’s identity and connection within the GBMSM community, we collected information on community engagement, community connectedness, social cohesion, underlying feelings of fear, and perceived stigma. We cared about these psychometric variables because research indicates that oxytocin is associated with trust and relationship building [82]. We also collected control level variables including age, marital status, education, individual income, sexual orientation, and “out” status.

## Analytical Approach

This is a quantitative analysis paper that draws on previous analyses of pay-it-forward and prosocial interventions to deeper understand the mechanism by which pay it forward works. We began by using confirmatory factor analysis to create latent variables for gratitude and seven psychometric variables: community engagement, community connectedness, trust, selfishness in the community, avoidance of the gay community, fear, and stigma. We then used a correlation matrix, binned scatterplots, and regression analyses to identify the relationship between individual factors and baseline oxytocin measurement. Using a difference-in-difference model, we compared the oxytocin levels of participants at the pay-it-forward clinic to those at the free test clinic. This model shows the change in oxytocin levels at the two points measured and indicates whether this change is different between the two clinic locations. Finally, we identified individual level factors that were associated with increasing or decreasing oxytocin concentrations.

## Results

Table 3 indicates provides summary statistics including the percentages and means for the baseline demographics of the population, split by clinic. A total of 48 men participated in this pilot study. 22 participants were in the free test arm at the public STD clinic, and 26 participants were in the pay-it-forward arm at the MSM clinic. Among the participants, the average age was 25 years old. The participants at the MSM clinic were slightly older than the participants at the Public STD clinic (26 vs. 25). Participants at the MSM clinic had higher education levels, with 27 percent of participants having received above a bachelor's degree and no MSM participants received only a high school or vocational school degree. The majority of participants in both clinics received a bachelor or associates degree. A much greater percentage of participants in the

MSM clinic had volunteered before. In both groups, the percentage of men that had volunteered for MSM causes in the past was distinctly less than the percentage of men that had volunteered at all. Only 19% of the entire sample had volunteered for MSM causes in the past. Most participants had only had sex with men in the past 12 months, however 13% of total participants did not want to disclose this information. The average number of sex partners in the last 3 months was 2, and this value was slightly higher in the public STD group (2.45 vs. 2.23). The majority of participants identified as homosexual, but the percentage identifying as homosexual was greater in the MSM group compared to the public STD group (88% vs. 73%). The degree to which men identified as “out” varied among participants but, on average, the participants in the MSM clinic were more “out” than those in the public STD clinic. At the 5% significant level, the latent variables (community engagement, community connectedness, trust, selfishness in the community, avoidance of the gay community, fear, and stigma) were not statistically different between clinics.

We took several steps to analyze the relationship between out covariates and latent psychometric variables and oxytocin concentration. Since these covariates were measured at baseline, we ran several analyses to determine the relationship between these measures and baseline oxytocin levels. To begin, we ran a correlation matrix between the seven psychometric latent variables and baseline oxytocin. This correlation indicated that there were weak associations between baseline oxytocin and gay community connectedness, trust in the gay community, and internalized fear. The other four variables had a very weak or no association with baseline oxytocin. Using binned scatterplots, we determined that as baseline oxytocin concentration increased, community connectedness levels decreased, trust decreased, and internalized fear decreased. Finally, we ran a regression on baseline oxytocin controlling for the



psychometric latent variables in addition to individual characteristics and clinic. The output from this regression is reported in Table 4.

Table 5 shows the differences in oxytocin measures between the two clinics. Oxytocin was measured at baseline and again after the introduction of the pay-it-forward or free test model. The average baseline oxytocin measurement was higher among the participants at the public STD clinic compared to those at the MSM clinic. Prior to the intervention, the average oxytocin measurement was 76 pg/ML (SD 91) at the public SD clinic and 50 pg/ML (SD 45) at the MSM clinics. After the intervention, the average oxytocin concentration at the Public STD clinic decreased to 70 pg/ML (SD 82) and slightly decreased at the MSM clinic to 49 pm/ML (SD 53). Of the 48 total participants, 17 experienced an increase in oxytocin concentration, while 31 experienced a decrease. At the Public STD clinic, 8 out of 14 participants experienced rising oxytocin levels, while at the MSM clinic 9 out of 17 participants experienced this increase. We did not find a notable difference in the change in oxytocin levels between the two clinics. A difference in difference model did not indicate a different change in individual oxytocin concentrations between the two groups.

Our analyses sought to understand the relationship between oxytocin concentration and its correlates. Using the latent variables generated through confirmatory factor analysis, we ran a series of analyses to develop a greater understanding of these correlations. A logistic regression on the likelihood of experiencing a positive oxytocin concentration change yielded insignificant results.

To further understand the relationship between the psychometric latent variables and individual oxytocin concentration, we divided the sample into two groups: those who experienced a positive oxytocin change and those who experienced a negative oxytocin change.

Table 6 represents the average measures of the latent psychometric variables separated by individuals who experienced an increase or decrease in oxytocin concentration. A lower score in gay community engagement and community connectedness indicated higher levels of engagement and connectedness. The individuals who experienced a rise in oxytocin demonstrated higher baseline community engagement, while those whose oxytocin levels decrease had greater community connectedness. Additionally, those who had an increase in oxytocin concentration at baseline had lower markers of perceived selfishness in the gay community and underlying feelings of fear. Meanwhile, those whose oxytocin concentration decreased indicated a greater trust in the gay community, a lower level of avoidance of the gay community and perceived stigma, and a greater baseline gratitude. These findings indicate that there is no clear connection between the baseline psychometric variables and subsequent change in oxytocin levels at the individual level of this study.

## Discussion

This study tested oxytocin levels in conjunction with a prosocial pay-it-forward approach. We sought to determine whether there was a connection between warm glow, gratitude, and oxytocin levels in individuals who participated in the pay-it-forward approach compared to those who received a free test. For future implementation of the pay-it-forward approach, it is important to consider the different baseline characteristics of men attending the clinic. Social constructs and psychometric baseline also can impact the implementation of the pay-it-forward approach. Additionally, the overall decrease in oxytocin concentration may have an impact on the effectiveness of this model. Additional research is needed to further develop an understanding of the connection between oxytocin concentration and the pay-it-forward approach.

GBMSM who presented to the MSM clinic were substantially different from GBMSM who presented to the public STD clinic. Differences between these two groups of men make comparison of free testing to pay-it-forward difficult. Previous research has found correlations between individual characteristics (age, education, etc.) and prosocial behavior [83]. These baseline traits may impact an individual's willingness to pay the STD test forward. A deeper understanding of why some men choose to visit or not visit the clinic can inform future marketing efforts and implementation of pay-it-forward.

We did not find a clear correlation between psychometric variables and oxytocin concentrations, but these characteristics are important in understanding healthcare utilization behaviors among marginalized populations. Community connectedness has been shown to have an impact on health outcomes among marginalized groups [84]. The connection between community connectedness and healthcare utilization is undeveloped and could help to explain the pay-it-forward approach. Future research focusing on the psychometric variables used in this study can further predict the success of pay-it-forward.

In our study, we found a majority (n=31) of participants experienced a decrease in oxytocin concentrations from baseline to post intervention. This was surprising because we expected participants who receive a free test may have feelings of gratitude and increased oxytocin. Previous research has observed an increase in oxytocin associated with gratitude [80]. The stress of waiting in a busy clinical environment may have contributed to decreasing oxytocin levels. This has implications for organizing the pay-it-forward approach because participants are asked whether they want to be tested and/or donate at the end of their time in the clinic, when oxytocin levels and mood may be down. Future research should consider the timing of decision making and attempt to optimize this timing.

## Strengths and Limitations

One strength of this study is its' novel approach to understanding the effect of pay-it-forward on participants. This study gave greater insight into the participant experience that can be used to inform future implementation of pay-it-forward.

One limitation of this study is that there were only two measurements of oxytocin. Oxytocin is a hormone that is impacted by external and internal factors including time of day and age [85]. While we field tested the oxytocin saliva measurements and determined the peak time after intervention that oxytocin concentrations rise, it is possible that the second oxytocin measurement is not indicative of the overall oxytocin concentration change within the individual. Future research should consider additional time points to see a full picture of oxytocin concentrations while at the clinic.

## Conclusion

This study focused on the measurement and analysis of the internal reaction of the pay-it-forward approach. We found that there were different baseline characteristics and traits of men attending the two clinics. Additionally, the overall decrease in oxytocin concentration may impact on the effectiveness of this approach. These findings are inconclusive and represent the need for further research to understand the connection between oxytocin concentration and the pay-it-forward approach.

Table 3: Summary Statistics

		Total n=48	Public STD Clinic n=22	MSM Clinic n=26	T Statistic	p
Age (mean, SD)		25.65	25.23	26.00	-0.58	0.56
		(4.55)	(4.55)	(4.60)		
Education	High school or vocational school	2.08	4.55	0.00	-1.00	0.32
	Bachelor or associate degree	75.00	77.27	73.08		
	Above bachelor's degree	22.92	18.18	26.92		
Income	<1500 RMB/month	20.83	22.73	19.23	0.43	0.67
	1500-3000 RMB/month	6.25	4.55	7.69		
	3001-5000 RMB/month	14.58	9.09	19.23		
	5001-8000 RMB/month	37.50	36.36	38.46		
	>8000 RMB/month	20.83	27.27	15.38		
Marital Status	Never Married	93.75	95.45	92.31	-0.44	0.66
	Engaged or Married	6.25	4.55	7.69		
Has volunteered for MSM causes in the past	Yes	18.75	9.09	26.92	1.59	0.12
Sexual Relations in Past 12 Months	No sexual relations in the past 12 months	2.08	4.55	0.00	1.80	0.08

	Only with men	85.42	72.73	96.15		
	Do not want to disclose	12.50	22.73	3.85		
Number of sex partners in the last 3 months (mean, SD)		2.33	2.45	2.23	0.33	0.74
		(2.33)	(2.76)	(1.95)		
	Bisexual	12.50	18.18	7.69		
	Not Sure	6.25	9.09	3.85		
Open (out) status as gay, bisexual, or a man attracted to other men	Not at all open (out)	35.42	45.45	26.92	-1.82	0.08
	A little bit open (out)	20.83	22.73	19.23		
	Somewhat open (out)	27.08	22.73	30.77		
	Very much open (out)	4.17	4.55	3.85		
	Open (out) to all or most people you know	12.50	4.55	19.23		

Table 4: Regression analysis on baseline oxytocin concentration

	Coefficient (Standard Error)
PIF Clinic	-10.31 (18.86)
Gay Community Engagement	-0.91 (14.60)
Community Connectedness	0.16 (16.95)
Trust in gay community	-12.08 (18.90)
Perceived selfishness in the gay community	8.86 15.88
Avoidance of the gay community	17.03 (27.34)
Underlying feelings of fear	-3.34 21.95
Perceived stigma	4.31 (16.11)
Age	-1.85 4.75
Engaged or married	-0.44 38.74
Education	
(Referent: High school or vocational school)	
Bachelor or associate degree	-153.99* (42.78)
Above bachelor's degree	-185.95* (43.72)
Sexual Orientation	
(Referent: homosexual)	
Bisexual	-30.07 (49.46)
Not sure	1.16 (43.68)

Baseline Gratitude	12.86 (14.51)
Out status	
(Referent: Not at all open)	
A little bit open	-85.60 (48.06)
Somewhat open	-70.85 (36.65)
Very much open	-115.28* (48.69)
Open to all or most people	-44.35 42.93
Has not volunteered for MSM-related causes	-13.02 (25.76)
Number of partners in the last 3 months	6.72 (3.90)
Constant	319.38 (150.24)
*Statistically Significant at 5%	
N= 48	

Table 5: Oxytocin Changes

	Public STD Clinic n=22	MSM Clinic n=26	T-Statistic	p
Pre Oxytocin (pg/mL) (mean, SD)	76.40 (91.01)	50.50 (44.52)	1.28	0.21
Post Oxytocin (pg/mL) (mean, SD)	70.00 (82.08)	49.20 (53.41)	1.06	-0.30
Change in Oxytocin (pg/mL) (mean, SD)	-6.40 (60.47)	-1.31 (26.22)	-0.38	0.70
Oxytocin Increase (percent of participants)	36.36	34.62	0.12	0.90



Table 6: Psychometric properties by oxytocin change

	Positive Oxytocin Change n=17	Negative Oxytocin Change n=31	T statistic	p
Gay Community Engagement	-0.03	0.02	0.18	0.86
Community Connectedness	0.22	-0.12	-1.21	0.23
Trust in gay community	-0.08	0.03	0.31	0.76
Perceived selfishness in the gay community	0.04	-0.02	-0.25	0.80
Avoidance of the gay community	-0.03	0.02	0.21	0.84
Underlying feelings of fear	0.06	-0.35	-0.34	0.74
Perceived stigma	-0.22	0.12	1.18	0.24
Baseline gratitude	-0.05	0.03	0.33	0.74

## CHAPTER 5: CONCLUSION

### Summary of Findings

Aim 1: Synthesize the peer reviewed literature on prosocial interventions used to promote public health and medical outcomes using a systematic review. In this aim we conducted a systematic review focusing on prosocial interventions and their impact on health and medical outcomes. We synthesized the data using a transformation of quantitative and mixed methods results to qualitative narratives and a data based convergent synthesis. We used meta-aggregation interpretation techniques to develop themes focusing on the effectiveness of prosocial interventions and the impact of individual, interpersonal, and contextual factors. We concluded that community connection, contextual influences, individual interest, scale-up and social effects, internal drive, and emotional expression can influence the implementation of prosocial interventions.

Aim 2: Describe the participant experience when they receive a gift and the warm glow feeling that people feel when they give to others. Overall, 24 GBMSM were interviewed. The participants average 24 years old and most had a bachelor's degree. The participants varied in how much they considered themselves open or out as a gay, bisexual, or a man attracted to other men. The themes that emerged from this analysis were worry surrounding STD testing, detachment from the LGBTQI community, unspecified gratitude, connection to other participants of pay-it-forward, and a sense of social responsibility and altruism. Based on this thematic analysis, we conclude that the pay-it-forward model highlights the need for connection

support, and health services for gay men in China. The pay-it-forward model has the potential to be effective in increasing rates of STD testing, and this qualitative analysis provides a deeper understand for how participation affects these men.

Aim 3: Determine whether receiving a gift as part of pay-it-forward is associated with transient feelings of gratitude and changes in oxytocin levels. This aim was a two-arm study comparing the pay-it-forward approach to a free test. A total of 48 men participated in this pilot study. 22 participants were in the free test arm at the public STD clinic, and 26 participants were in the pay-it-forward arm at the MSM clinic. Using quantitative analyses, we focused on establishing a connection between warm glow, gratitude, and oxytocin levels in individuals who participated in the pay-it-forward approach compared to those who received a free test. In this study we learned lessons that can inform future research on oxytocin and the pay-it-forward approach. We found differences of baseline characteristics between the men attending the two clinics, we also saw a general decrease in oxytocin levels. These findings represent the need for further research to understand the connection between oxytocin concentration and the pay-it-forward approach.

### Policy Implications and Future Directions

The findings from this dissertation have several policy implications. To begin, community connection plays an important role in prosocial interventions. This theme emerged in both the systematic review and the pay-it-forward studies. Policy makers intent on utilizing prosocial behavior should carefully consider the role of community connection in their implementation. Policy makers should consider the level of community connection among their population of interest before implementing their intervention. Using this information, policy

makers can best determine how to enhance that connection through their programming (e.g., incorporating an opportunity for participants to write each other post cards).

A second policy implication from this dissertation is the importance of contextualized and locally created health improvement programs. This dissertation highlights the key role of implementing targeted interventions. Pay-it-forward was developed using a co-creation process. Policy makers need to consider the full picture of the location, population, internal, and external factors of prosocial interventions to maximize the likelihood that they will achieve the desired results.

Future studies can be conducted to develop a greater understanding of the mechanism by which pay-it-forward works. While we have touched on the importance of community connection, an investigation into the relationship between community connectedness and test uptake will provide even more insight. We hypothesize that those who feel a greater sense of connection to the community at baseline or because of pay-it-forward will be more likely to receive testing as part of this project, but this relationship is currently undetermined.

This dissertation explored a novel way to measure the internal reaction of an intervention. While the oxytocin measurements were insignificant in this small population, future research can further explore the use of measuring oxytocin in prosocial interventions. More insight can be gained regarding the utility of oxytocin measurement. If a connection is established, oxytocin measurements may be able to objectively measure the internal reaction of a prosocial intervention. We are hopeful that future researchers will continue studying this relationship.

## Conclusion

This dissertation studied prosocial interventions and their impact on health and medical outcomes. We specifically focused on the pay-it-forward approach. To further understand prosocial behavior, we conducted a systematic literature review focusing on prosocial interventions and their effect on health or medical outcomes. This systematic review found that individual interests and community connectedness are vital aspects of prosocial interventions. Informed by the systematic review, the qualitative analysis found that the pay-it-forward approach highlights the need for connection, support, and health services for gay men in China. The quantitative analysis found insignificant results but identified baseline community connection characteristics that differed among populations of clinic.

**APPENDIX 1.1: COCHRANE COLLABORATION'S TOOL TO ASSESS RISK OF BIAS IN RCT STUDIES**

	Lead Author/ Year	Title	Selection Bias	Performance Bias	Detection Bias	Attrition Bias	Reporting Bias
1	Aknin 2013	Prosocial spending and well-being: cross-cultural evidence for a psychological universal	High	Low	Unclear	Low	Low
2	Alden 2013	If it makes you happy: Engaging in kind acts increases positive affect in socially anxious individuals	Unclear	Low	Low	Low	Low
3	Alleva 2021	I appreciate your body, because... Does promoting positive body image to a friend affect one's own positive body image?	Low	Low	Low	Low	Low
4	Dunn 2008	Spending money on others promotes happiness	Unclear	Low	Low	Unclear	Unclear

5	Fritz 2021	Kindness and cellular aging: A pre-registered experiment testing the effects of prosocial behavior on telomere length and well-being	Low	Low	Low	Low	Low
6	Galarraga 2020	Small sustainable monetary donation-based incentives to promote physical activity: A randomized controlled trial	Low	High	Low	High	Low
7	Harkins 2017	A trial of financial and social incentives to increase older adults' walking	Low	Low	Low	Low	Low
8	Haydon 2022	Kindness interventions for early-stage breast cancer survivors: An online, pilot randomized controlled trial	Unclear	Low	Low	Low	Low
9	Hu 2022	Peer charity donation, gratitude, and self-esteem among left-behind children	Low	High	Unclear	Low	Low
10	LuengoKanacri 2020	Cross-national evidences of a school-based universal programme for promoting prosocial behaviours in peer interactions: Main theoretical communalities and local unicity	High	High	Low	Low	Low

11	Miles 2022	Using prosocial behavior to safeguard mental health and foster emotional well-being during the COVID-19 pandemic: A registered report of a randomized trial	Low	Low	High	Low	Low
12	Ouweneel 2014	On being grateful and kind: results of two randomized controlled trials on study-related emotions and academic engagement	Unclear	High	Low	Low	Low
13	Regan 2022	The genomic impact of kindness to self vs. others: A randomized controlled trial	Low	Low	Low	High	Low
14	Rini 2014	Harnessing benefits of helping others: a randomized controlled trial testing expressive helping to address survivorship problems after hematopoietic stem cell transplant	Low	Low	Low	Low	Low
15	Sarason 1993	Increasing participation of blood donors in a bone-marrow registry	Low	Low	Low	Low	Low



16	Schreier 2013	Effect of volunteering on risk factors for cardiovascular disease in adolescents: a randomized controlled trial	Low	High	Low	High	Low
17	Shillington 2021 I	Kindness as an Intervention for Student Social Interaction Anxiety, Affect, and Mood: The KISS of Kindness Study	Low	Low	Low	High	Low
18	Shillington 2021 II	Kindness as an Intervention for Student Social Interaction Anxiety, Resilience, Affect, and Mood: The KISS of Kindness Study II	Low	High	Low	Low	Low
19	Sumida 2014	The 'donations for decreased ALT (D4D)' prosocial behavior incentive scheme for NAFLD patients	Unclear	Low	Low	Low	Low
20	Sung 2022	Development of a Psychometric Tool to Measure Community Solidarity Among Sexual Minorities: Evidence From a Pay-it-Forward Randomized Controlled Trial	Low	Low	Low	Low	Low
21	Varma 2022	Prosocial behavior promotes positive emotion during the COVID-19 pandemic	Unclear	Low	Low	Low	Low

22	Wieners 2021	To whom should i be kind? A randomized trial about kindness for strong and weak social ties on mental wellbeing and its specific mechanisms of change	Low	Low	High	High	Low
23	Williamson 2017	Helping Yourself by Offering Help: Mediators of Expressive Helping in Survivors of Hematopoietic Stem Cell Transplant	Low	Low	Low	Low	Low
24	Yang 2020	Pay-it-forward gonorrhoea and chlamydia testing among men who have sex with men in China: a randomised controlled trial	Low	High	Low	Low	Low

**APPENDIX 1.2: ROBINS-I TOOL RESULTS FOR NON-RANDOMIZED STUDIES**

	Lead Author / Year	Title	Overall Bias	Bias due to confounding	Bias in selection of participants	Bias in classification of interventions	Bias due to deviations from intended interventions	Bias due to missing data	Bias in measurement of outcomes	Bias in selection of reported result
1	Li 2019	Pay-it-forward strategy to enhance uptake of dual gonorrhoea and chlamydia testing among men who have sex with men in China: a pragmatic, quasi-experimental study	Low	Low	Moderate	Low	Low	Low	Low	Low
2	Ngai 2021	Effectiveness of a school-based programme of animal-assisted humane education in Hong Kong for the promotion of social and emotional learning: A quasi-experimental pilot study	Moderate	Moderate	High	Low	Low	Low	Moderate	Low

3	Vliek 2014	I want to behave prosocially and I can choose to do so: Effectiveness of TIGER (Kanjertraining) in 8- to 11-year-olds	Low	Low	Moderate	Low	Low	Low	Low	Low
4	Wu 2022	Effectiveness of a pay-it-forward intervention compared with user-paid vaccination to improve influenza vaccine uptake and community engagement among children and older adults in China: a quasi-experimental pragmatic trial	Low	Low	Moderate	Low	Low	Low	Low	Low

### APPENDIX 1.3: SUMMARY OF STUDIES

S/N	Lead Author / Year	Title	Country	Prosocial Nature of Intervention	Study Design	Study Hypotheses	Primary Outcome	Statistical Analysis Conducted	Key finding
1	Aknin 2013	Prosocial spending and well-being: cross-cultural evidence for a psychological universal	Multi-country	Prosocial spending	4 Studies: Correlational analysis and experimental studies	Humans around the world experience hedonic benefits from generous spending.	Wellbeing, happiness, positive affect	Various regression analyses	Reward experienced from helping others may be deeply ingrained in human nature, emerging in diverse cultural and economic contexts.
2	Alden 2013	If it makes you happy: Engaging in kind acts increases positive affect in socially anxious individuals	Canada	Acts of kindness	Randomized controlled trial	Engaging in acts of kindness toward others could produce sustained increases in positive affect (PA) in highly socially anxious individuals.	Positive affect	Regression analyses	Positive affect can be increased in individuals with high levels of social anxiety and PA enhancement strategies like performing kind acts may result in wider social benefits.

3	Alleva 2021	I appreciate your body, because... Does promoting positive body image to a friend affect one's own positive body image?	The Netherlands	Expressions of kindness	Randomized controlled trial	Promoting positive body image to a friend could lead to improvements in one's own positive body image.	Personal body appreciation	Separate one-way analyses of covariance	Women who promoted positive body image to a friend did not experience a more positive body image compared to women in an active control group. Instead, participants in both groups experienced improvements in state functionality appreciation and state body appreciation, with effect sizes ranging from medium to large.
4	Dunn 2008	Spending money on others promotes happiness	United States	Prosocial spending	Experimental methodology	People who receive an economic windfall experience greater happiness after receiving the windfall if they spend it on others.	Happiness	Regression analysis predicting happiness	Spending money on others promotes happiness more than spending money on oneself

5	Fritz 2021	Kindness and cellular aging: A pre-registered experiment testing the effects of prosocial behavior on telomere length and well-being	United States	Acts of kindness	Single-blind, three-arm randomized controlled trial	A 4-week kindness intervention could slow leukocyte telomere shortening and increase well-being.	#1 Life satisfaction, #2 flourishing, #3 loneliness, #4 Leukocyte Telomere Length (LTL)	Linear mixed-effects model analyses	The salubrious effects of prosocial behavior in the short term are not likely due to the inhibition of cellular aging (at least as indexed by telomere length). However, extending kindness to others holds promise as a future research direction for interventions to alleviate loneliness.
6	Galarraga 2020	Small sustainable monetary donation-based incentives to promote physical activity: A randomized controlled trial	United States	Charitable donations resulting from participation	Three-arm randomized controlled trial	Delivering small monetary and donation-based incentives within a community setting can promote physical activity	Days of attendance at the YMCA	Quantile regression	The findings provide early support for small monetary incentives and charitable donations for promoting PA in community settings.

7	Harkins 2017	A trial of financial and social incentives to increase older adults' walking	United States	Charitable donations resulting from participation	Four-arm randomized controlled trial	Social goals and donations can improve older adults' initial uptake and short-term retention of increased levels of walking.	Mean proportion of days that step-per-day goals were achieved during the 16-week intervention period	Generalized estimating equations	Incentives that use donations to a charity of choice, personal financial incentives, or combined charity donations and personal financial incentives each increase older adults' initial uptake of increased levels of walking. However, the effects decreased and were no longer significant after the interventions were discontinued.
8	Haydon 2022	Kindness interventions for early-stage breast cancer survivors: An online, pilot randomized controlled trial	United States	Acts of kindness	Randomized controlled trial	Participants in each of the three kindness conditions (acts of kindness to others, acts of kindness to self, and selfkindness meditation) would demonstrate beneficial effects, from pre- to post-intervention, relative to those in the control condition	Psychological well-being and depressive symptoms	ANOVA	Among breast cancer survivors, performing prosocial acts may enhance feelings of social support.



9	Hu 2022	Peer charity donation, gratitude, and self-esteem among left-behind children	China	Prosocial spending (peer charity)	School-based intervention	Charity donations from non-LBC (left behind children) classmates should increase gratitude among the LBC. Gratitude should be associated with higher self-esteem, less depression, and less social anxiety among the LBC.	Gratitude, self-esteem, depression	Structural equation modeling analysis	Gratitude was associated with higher self-esteem and lower depression among LBC.
10	Li 2019	Pay-it-forward strategy to enhance uptake of dual gonorrhea and chlamydia testing among men who have sex with men in China: a pragmatic, quasi-experimental study	China	Paying-it-forward	Quasi-experimental pragmatic study	Pay-it-forward interventions can improve gonorrhea and chlamydia testing among Chinese MSM.	Test uptake	Chi-square test and logistic regression	The model substantially increased test uptake compared to the standard of care. From a financial perspective, most of the costs associated with testing were supported by local MSM, suggesting a viable pathway to sustainable service delivery

11	Li 2020	A secondary mixed methods analysis of a pay-it-forward gonorrhea/chlamydia testing program among men who have sex with men in China	China	Paying-it-forward	Sequential explanatory mixed methods design	Paying-it-forward can drive test uptake and donations, and socioeconomic factors may correlate with such outcomes	Test uptake	Logistic regression and multinomial regression	This study leveraged the original RCT and quasi-experimental papers (Li 2019 and Yang 2020) to explore factors associated with test uptake among participants in the pay-it-forward arms, and found that this intervention can reduce cost barriers, leverage generosity and reciprocity, and mobilize community altruism.
12	Lueng oKana cri 2020	Cross-national evidences of a school-based universal programme for promoting prosocial behaviours in peer interactions: Main theoretical communalities and local unicuity	Colombia and Chile	Acts of kindness	Randomized controlled trial	Prosocial behavior can lower physical aggression in a school-based universal intervention adapted in two different (non-Western) countries, Colombia and Chile.	Prosocial behavior Physical Aggression	Analysis of covariance (ANCOVA)	The improvement on prosocial behaviours in both countries predicted significantly lower level of physical aggression.

13	Miles 2022	Using prosocial behavior to safeguard mental health and foster emotional well-being during the COVID-19 pandemic: A registered report of a randomized trial	United States and Canada	Acts of kindness	3-week experimental intervention	Prosocial behavior increases happiness and the sense of meaning in life. Prosocial behavior reduces depression and anxiety.	Happiness, sense of meaning in life, depression, anxiety	Random intercept model	Prosocial acts may provide small, lasting benefits to emotional well-being and mental health.
14	Ngai 2021	Effectiveness of a school-based programme of animal-assisted humane education in Hong Kong for the promotion of social and emotional learning: A quasi-experimental pilot study	Hong Kong	Expressions of kindness	Sequential mixed-methods formative evaluation	Animal-assisted, school-based humane education programme can promote a humane attitude and enhance social-emotional competence.	social and emotional competence	Paired sample t tests and a mixed ANOVA	The preliminary results of this pilot study indicate positive effects of the programme.

15	Ouweneel 2014	On being grateful and kind: results of two randomized controlled trials on study-related emotions and academic engagement	The Netherlands	Acts of kindness	Randomized controlled trial	A positive psychological intervention can enhance study-related positive emotions and academic engagement, and reduce study-related negative emotions.	Positive and negative emotions	RM-ANOVA analyses	The kindness intervention had a positive influence on both positive emotions and academic engagement, though not in the long run. The results showed no effects on negative emotions in either of the two interventions.
16	Regan 2022	The genomic impact of kindness to self vs. others: A randomized controlled trial	United States	Acts of kindness	Randomized controlled trial	A 4-week kindness intervention can reduce expression of a stress-related immune response gene signature known as the Conserved Transcriptional Response to Adversity (CTRA).	A stress-related immune response gene signature known as the Conserved Transcriptional Response to Adversity (CTRA).	Mixed effect linear models	Prosocial engagement—doing something kind for others rather than oneself—reduces CTRA gene expression.

17	Rini 2014	Harnessing benefits of helping others: a randomized controlled trial testing expressive helping to address survivorship problems after hematopoietic stem cell transplant	United States	Expressions of kindness	4- arm randomized controlled trial	Expressive helping (EH) intervention can reap benefits around survivorship problems among cancer survivors.	general distress, self-reported physical symptoms, HRQOL	Analysis of covariance (ANCOVA)	Findings supported hypothesized benefits of expressive helping for physical symptoms and general distress among survivors with moderate to severe survivorship problems.
18	Sarason 1993	Increasing participation of blood donors in a bone-marrow registry	United States	Blood donation	Randomized controlled trial	Recognizing blood donors' contributions and involving them in a blood-center-related activity can increase the rate of participation in the bone-marrow registry.	Joining the bone marrow registry	Logistic regression	The percentage of blood donors who joined the bone-marrow registry was 2.0 times greater than the control group of blood donors who received only the brochure and 2.2 times greater than the control group of blood donors who received neither the questionnaire nor the brochure

19	Schreier 2013	Effect of volunteering on risk factors for cardiovascular disease in adolescents: a randomized controlled trial	Canada	Volunteering	Randomized controlled trial	Volunteering with elementary school-aged children can improve adolescents' cardiovascular risk profiles.	Cardiovascular risk markers of C-reactive protein level, interleukin 6 level, total cholesterol level, and body mass index	Analysis of covariance	Adolescents who volunteer to help others also benefit themselves, suggesting a novel way to improve health.
20	Shillington 2021	Kindness as an Intervention for Student Social Interaction Anxiety, Affect, and Mood: The KISS of Kindness Study	Canada	Acts of kindness	Repeated, mixed-methods design	Performing acts of kindness can improve affect, social interaction anxiety, and mood of undergraduate students.	Affect, social interaction anxiety and mood of students	Quantitative: ANOVA Qualitative: Summative content analysis	The study revealed no statistically significant differences between groups. Rather, participants in both groups reported that their involvement in the study provided an overall positive experience.

21	Shillington 2021 II	Kindness as an Intervention for Student Social Interaction Anxiety, Resilience, Affect, and Mood: The KISS of Kindness Study II	Canada	Acts of kindness	Randomized controlled trial	Deliberate acts of kindness (DAKs) can impact stress-related outcomes of resilience, social interaction anxiety, affect, and mood of undergraduate and graduate students.	Resilience, social interaction anxiety, affect	Quantitative: Pearson's chi-squared test and mixed-model ANOVA Qualitative: Inductive content analysis	Intervention group participants experienced increased resilience, reduced social anxiety and negative affect, and described improvements in mood. Specifically, there was a significant difference in resilience within the intervention group.
22	Sumida 2014	The 'donations for decreased ALT (D4D)' prosocial behavior incentive scheme for NAFLD patients	Japan	Charitable donations resulting from participation	Randomized controlled trial	Prosocial behavior incentives can serve as an effective intrinsic motivational factor in comparison with conventional dietary and exercise intervention alone for non-alcoholic fatty liver disease (NAFLD) patients.	ALT decrease after 12 weeks	Mann-Whitney U-test or Wilcoxon's ranked sum test	Promoting patients' intrinsic motivation by incorporating 'D4D' prosocial behavior incentive into conventional dietary and exercise intervention may provide a means to improve NAFLD.

23	Sung 2022	Development of a Psychometric Tool to Measure Community Solidarity Among Sexual Minorities: Evidence From a Pay-it-Forward Randomized Controlled Trial	China	Paying-it-forward	Randomized controlled trial	Community solidarity means would be higher in the pay-it-forward intervention group and correlate with higher uptake of STI testing.	STD testing uptake	Factor analyses	Community solidarity among MSM in China can be characterized by 3 factors: engagement, social network support, and sense of belonging.
24	Varma 2022	Prosocial behavior promotes positive emotion during the COVID-19 pandemic	China	Prosocial spending	Experimental	Prosocial behavior leads to higher levels of self-reported positive affect, empathy and social connectedness.	Well-being	Analysis of Covariance (ANCOVA)	Prosocial (vs. non-prosocial or prosself) behavior led to higher levels of self-reported positive affect, empathy and social connectedness.



25	Vliek 2014	I want to behave prosocially and I can choose to do so: Effectiveness of TIGER (Kanjertaining) in 8- to 11-year-olds	The Netherlands	Expressions of kindness	Quasi-experimental design	TIGER reduces psychosocial problems in eight- to eleven-year-olds in a mental health-care setting.	psychosocial problem behavior	MANOVAS	Results indicated that TIGER significantly reduced externalizing and internalizing problems.
26	Wieners 2021	To whom should i be kind? A randomized trial about kindness for strong and weak social ties on mental wellbeing and its specific mechanisms of change	The Netherlands	Acts of kindness	Three-arm randomized controlled trial	A 4-week acts-of-kindness intervention targeting different types of social ties differ in impact on students' mental wellbeing, positive relations, depressive symptoms, anxiety, and perceived stress.	Mental wellbeing, positive relations, depressive symptoms, anxiety, and perceived stress	2-tailed tests with a significance level < .05	Prosocial behaviour for strong social ties could boost mental wellbeing more than performing kind acts for weak social ties or unspecified social ties.

27	Williamson 2017	Helping Yourself by Offering Help: Mediators of Expressive Helping in Survivors of Hematopoietic Stem Cell Transplant	United States	Expressions of kindness	Experimental	Word use reflective of emotional expression, cognitive processing, and change in perspective mediates the effects of expressive helping.	Psychological distress and physical symptom bother	Linguistic Inquiry and Word Count and multi-level modeling	The central finding of this study is that expressive helping carries its positive effects on distress in part through participants' higher expression of positive emotions, consistent with theory and research.
28	Wu 2022	Effectiveness of a pay-it-forward intervention compared with user-paid vaccination to improve influenza vaccine uptake and community engagement among children and older adults in China: a quasi-experimental pragmatic trial	China	Paying-it-forward	Quasi-experimental design	Pay-it-forward interventions can improve influenza vaccine uptake among children and older adults in China and spur donations	Vaccine uptake	Multivariable regression models	The study found that the pay-it-forward approach improved influenza vaccine uptake among children and older adults. It also spurred greater confidence and perceived importance of such vaccines, and led to an overall lower economic cost per vaccine due to the donations from participants who paid it forward.

29	Yang 2020	Pay-it-forward gonorrhoea and chlamydia testing among men who have sex with men in China: a randomised controlled trial	China	Paying-it-forward	Randomized controlled trial	Pay-it-forward interventions can improve gonorrhoea and chlamydia testing among Chinese MSM.	Test uptake	Descriptive analyses and generalised estimating equations	The pay-it-forward strategy can increase gonorrhoea and chlamydia testing uptake among Chinese MSM and could be a useful tool for scaling up preventive services that carry a mandatory fee.
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**APPENDIX 1.4: THEMES DERIVED FROM META-AGGREGATION**

Domain	Theme	Subtheme	Findings
Interpersonal and contextual factors impacting the effect of prosocial interventions	Community and Connection	Community	The model substantially increased test uptake compared to the standard of care. From a financial perspective, most of the costs associated with testing were supported by local MSM, suggesting a viable pathway to sustainable service delivery
			The Kind Acts procedure significantly increased participants' satisfaction with their social relationships and reduced their concern with negative social outcomes relative to the activity monitoring control and, to a lesser extent, performing behavioral experiments.
			Pay-it-forward spurred community engagement by actively engaging MSM in the development and implementation of the service.
			These findings indicate that cognitive behavioural techniques taught in a peer group with an additional parent training and a focus on prosocial intentions and responsibility of children is effective for children with psychosocial problems.
			Participants described feeling a sense of belonging and experiencing less feelings of loneliness.
			By participating in the program, pay-it-forward participants receive not only the test, but also the benefit of feeling cared for by others and the opportunity to help others.
			Among breast cancer survivors, performing prosocial acts may enhance feelings of social support.
			Engaging in other- focused kindness may enhance perceptions of social support among breast cancer survivors.
			Community solidarity among MSM in China can be characterized by 3 factors: engagement, social network support, and sense of belonging.
			Positive affect can be increased in individuals with high levels of social anxiety and PA enhancement strategies like performing kind acts may result in wider social benefits.
		Connection to Recipient	The major finding of this study was that in the group that received the appreciative letter and questionnaire and later a brochure about the bone-marrow registry, the percentage of blood donors who joined the bone-marrow registry was 2.0 times greater than the control group of blood donors who received only the brochure and 2. 2 times greater than the control group of blood donors who received neither the questionnaire nor the brochure
			Positive reactions of people towards the participants were likely to strengthen the effects of the acts of kindness.
			Many participants preferred performing acts of kindness for friends and family because they were able to see the immediate impact, in comparison to performing the acts for strangers

			<p>Prosocial behaviour for strong social ties could boost mental wellbeing more than performing kind acts for weak social ties or unspecified social ties.</p> <p>The results of this study suggest that the donor's perceived relationship to a blood center may play an influential role in how he or she responds to a request it might make</p> <p>Participants stated that they experienced gratification, improved mood, and increased happiness upon seeing the positive reactions of their DAKs receivers.</p> <p>Gratitude was associated with higher self-esteem and lower depression among LBC.</p> <p>Sense of belonging was higher in the pay-it-forward intervention arm and may be associated with the uptake of gonorrhea/chlamydia test.</p> <p>In the present study, many intervention group participants noted that seeing the reaction of the acts of kindness recipient improved their wellbeing (i.e., increased their happiness and improved their overall mood, made them 'feel good', and encouraged them to continue engaging in the behavior).</p>
Interpersonal and contextual factors impacting the effect of prosocial interventions	External Influences Affecting Health Outcomes	Negative effect	<p>An increase of psychological distress was detected in the whole sample throughout the intervention, independent of the kindness condition.</p>
		Atmosphere/ Context	<p>The critical component to enhance the efficacy of the programme is the creation of a prosocial and empathetic atmosphere in classrooms. Based on the proposed model, programme effectiveness would be affected by inner contextual factors such as the classroom and school characteristics.</p> <p>Moreover, this study revealed the importance of contextual factors, such as school policy and community culture, on prosocial behaviour development.</p> <p>Participants in both groups may have experienced improvements in positive body image as a result of experiencing greater positive affect overall.</p> <p>Charity donation may be less self-threatening in a collective society where reciprocating charity donations are a social routine.</p> <p>The nature of kind acts and their intended recipient plays a key role in shaping the genomic impact of kindness.</p> <p>Psychological benefits were larger when generous acts were unrelated to COVID-19.</p> <p>Prosocial acts, particularly when enacted for a cause that is not directly related to the pandemic, could be a fruitful avenue for improving well-being during a pandemic.</p> <p>The specific context of receiving a generous gift is likely to facilitate implementation and build trust in the service.</p>

		Improvement in all groups	<p>The study revealed no statistically significant differences between groups. Rather, participants in both groups reported that their involvement in the study provided an overall positive experience.</p> <p>Participants in both groups experienced improvements in state functionality appreciation and state body appreciation, with effect sizes ranging from medium to large.</p> <p>The high rates of test uptake in the pay-what-you-want arm suggests that free testing itself might be responsible for a substantial portion of the test uptake effect.</p>
Individual factors impacting the effect of prosocial interventions	Individual Interest	No individual improvement	Expressive helping did not benefit survivors in the low survivorship problems cluster. There was probably little room for improvement in these survivors, who demonstrated normal functioning to mild impairment.
			None of these interventions led to changes in well-being or depressive symptoms (primary outcomes) relative to the daily activity-writing control.
			Those assigned to perform prosocial acts did not differ significantly in depression, anxiety, happiness, or the belief that their life had meaning and was valuable from those assigned to report their daily activities.
		Personal Financial Decisions	Women who promoted positive body image to a friend did not experience a more positive body image compared to women in an active control group.
			This RCT showed that incentives that use donations to a charity of choice, personal financial incentives, or combined charity donations and personal financial incentives each increase older adults' initial uptake of increased levels of walking. However, the effects decreased and were no longer significant after the interventions were discontinued.
			There were no significant differences between monetary and donation incentives conditions.
			When given the choice between personal financial incentives and charitable donations, as in the combined group, participants were more likely to keep their earnings than to donate or share them.
The absence of a difference between the three (donations to a charity of choice, personal financial incentives, or combined charity donations and personal financial incentives) intervention groups suggests that these interventions may be equally effective, though this study was powered only to show a difference between each intervention and the control group.			

Individual factors impacting the effect of prosocial interventions	Internal Drive	Internal Benefits to Giver	One of the possible reasons for the improvement in self-control can be attributed to direct physical contact with the service animals. Petting an animal can induce relaxing physiological and neurological responses such as reduction in systolic blood pressure, lower heart rate, and reduction of cortisol, resulting in stabilising emotions and a calming effect
			Among those in the volunteer group, higher postintervention empathic concern and altruistic behaviors were associated with lower levels of cardiovascular risk markers (adjusting for baseline values). Those in the control group showed no such associations.
			Spending money on others promotes happiness more than spending money on oneself
			Individuals who engaged in acts of kindness experienced a significant improvement in resilience. This change in resilience might be attributable to the positive empathy experienced by participants.
			As hypothesized, intervention group participants experienced increased resilience, reduced social anxiety and negative affect, and described improvements in mood. Specifically, there was a significant difference in resilience within the intervention group.
			Prosocial acts may provide small, lasting benefits to emotional well-being and mental health.
			Prosocial engagement—doing something kind for others rather than oneself—reduces CTRA gene expression.
			Prosocial (vs. non-prosocial or proself) behavior led to higher levels of self-reported positive affect, empathy and social connectedness.
			The preliminary results of this pilot study indicate positive effects of the animal-assisted, school-based humane education programme.
			Internal Motivators/Factors
		Promoting patients' intrinsic motivation by incorporating 'D4D' prosocial behavior incentive into conventional dietary and exercise intervention may provide a means to improve NAFLD.	
		Our findings suggest that the reward experienced from helping others may be deeply ingrained in human nature, emerging in diverse cultural and economic contexts.	
		The salubrious effects of prosocial behavior in the short term are not likely due to the inhibition of cellular aging (at least as indexed by telomere length).	
		Internal Reward	These promising findings provide early support for small monetary incentives and charitable donations for promoting PA in community settings.
			Exploratory analyses revealed a pattern of results suggesting that engagement in either kindness activity led to reductions in loneliness across time
			Engaging in kind acts resulted in significant increases in PA that were sustained over the 4-week period.
			Adolescents who volunteer to help others also benefit themselves, suggesting a novel way to improve health.
			CTRA gene regulation is most sensitive to the social target of kindness (other people vs oneself) rather than the production of kind acts per se, with favorable effects observed in those who performed kind acts for others but not in those who performed kind acts for themselves.

			Intervention group participants described an increase in self-esteem via engaging in the acts of kindness. Many noted that they felt like a good person and/or better about themselves having engaged in acts of kindness.
Individual factors impacting the effect of prosocial interventions	Emotional Expression	Expressive Helping	The central finding of this study is that expressive helping carries its positive effects on distress in part through participants' higher expression of positive emotions, consistent with theory and research.
			Writing focused on peer helping was only beneficial when it was preceded by expressive writing; the combination appears to have been critical.
			Findings supported hypothesized benefits of expressive helping for physical symptoms and general distress among survivors with moderate to severe survivorship problems.
		Emotions	Positive psychological interventions seem to foster positive emotions and academic engagement, but do not decrease negative emotions.
			The kindness intervention had a positive influence on both positive emotions and academic engagement, though not in the long run.
			The results showed no effects on negative emotions in either of the two interventions
			Positive emotions and self-esteem were not significant mediator variables in the current study.



## APPENDIX 1.5: GRADE ASSESSMENT AND CERTAINTY OF EVIDENCE

Certainty of Evidence							Certainty of Evidence	Importance
Number of studies	Study Design	Risk of bias	Consistency	Directness	Precision	Other Considerations		
Studies assessing the impact of acts of kindness on improving health outcomes (Alden 2013; Fritz 2021; Haydon 2022; LuengoKanacri 2020; Miles 2022; Ouweneel 2014; Regan 2022; Sarason 1993; Schreier 2013; Shillington 2021a; Shillington 2021b; Wieners 2021)								
12	Randomized control trials	Mild	Some inconsistency	Some indirectness	Some imprecision	Health outcomes were varied	Low	Important
Studies assessing the impact of expressions of kindness on improving health outcomes (Alleva 2021; Ngai 2021; Rini 2014; Vliek 2014; Williamson 2017)								
5	Randomized control trial, quasi-experimental trial	Mild	No inconsistency	Some indirectness	Mild imprecision	Health outcomes were varied	Moderate	Important
Studies assessing the impact of paying-it-forward on improving health outcomes (Li 2019; Li 2020; Sung 2022; Wu 2022; Yang 2020)								
5	Randomized control trial, quasi-experimental trial, mixed-methods	Mild	No inconsistency	No serious indirectness	None	None	Moderate	Important
Studies assessing the impact of prosocial spending on improving health outcomes (Aknin 2013; Dunn 2008; Hu 2022; Varma 2022)								
4	Randomized control trial, experimental, mixed-methods	Mild	No inconsistency	No serious indirectness	None	None	Moderate	Important
Studies assessing the impact of charitable donations through participation in activities on improving health outcomes (Galarraga 2020; Harkins 2017; Sumida 2014)								
3	Randomized control trial	Mild	No inconsistency	Some indirectness	Mild imprecision	Health outcomes were varied	Moderate	Important

**APPENDIX 1.6: CONSIDERATIONS FOR ENHANCING THE EFFECT OF PROSOCIAL INTERVENTIONS**

Level	Considerations
Individual level Factors	<ul style="list-style-type: none"> <li>• The motivation and benefit to the giver should be carefully considered. Higher levels of intrinsic motivation can increase the positive effects of the intervention and ideally provide enough benefit to the giver that he or she will continue to engage in this prosocial behavior.</li> <li>• An individuals' available resources, health and psychological wellbeing can also impact one's ability to benefit from a prosocial intervention. Future interventions should consider the baseline of such factors among participants</li> </ul>
Interpersonal and contextual factors	<ul style="list-style-type: none"> <li>• According to the findings of this review, tying in a connection to the recipient and community support can effectively improve the likelihood improving a desired health or medical outcome using a prosocial intervention.</li> </ul>
Contextual factors	<ul style="list-style-type: none"> <li>• When implementing a prosocial intervention, it is essential the researchers consider the overall atmosphere that they are creating for the participants in both the treatment and control group.</li> <li>• An atmosphere that is overly research focused, positive, or negative could impact results, and affect successful implementation of this intervention in other settings.</li> </ul>
Nature of prosocial interventions	<ul style="list-style-type: none"> <li>• Certain prosocial interventions had greater effectiveness than others; including those that included expressions of kindness, charitable donations, paying-it-forward (moderate certainty of evidence), as well as acts of kindness, prosocial spending, blood donation and volunteering time (low certainty of evidence).</li> <li>• These might be due to individual, interpersonal, and contextual factors highlighted above, which should be considered in future implementation.</li> </ul>

## APPENDIX 2.1: QUALITATIVE INTERVIEW GUIDE

### "Pay-it-forward" project overview

1. When did you participate in the "pay-it-forward" project?
2. If you remember, how much did you pay for the "pay-it-forward" project?
3. Did you create a message, image, or text as part of the project?
4. If you did, what did you write/share and what was your inspiration for this message?

### Project content and "pay-it-forward" project participation experience

5. Can you tell us roughly your thoughts and impressions about the "pay-it-forward" project?
6. In the process of participating in the "pay-it-forward" project, which aspects of the project are better and which aspects are not well done?
7. What aspects make you trust the "pay-it-forward" project?
8. What aspects make you worried or hesitant about participating in the "pay-it-forward" project?
9. Which aspects of the project ultimately led you decision to participate?
10. How do you think of your participation in the program? (was it passing on your love? Obligation? Reciprocity? Etc. )
11. Did you see the postcard written by the last participant?
12. If you saw a postcard, what do you think of the postcard?
13. Can these postcards help you better understand the "pay-it-forward" project?
14. How do you feel about the previous participant?
15. Why did you choose to write (or not write) a postcard for the next participant?
16. Can you talk about the main reasons why you decided to be tested for chlamydia/gonorrhea?

### Think back to the amount of money you donated to the "pay-it-forward" project

17. Did you worry about how much you should donate?
18. Compared with your peers, how do you feel about the amount of your donation?
19. What do you think is the average donation amount for the "pay-it-forward" project?
20. What factors might make you donate more/less?
21. How did you feel when we introduced the "pay-it-forward" project?
22. How did you feel when you were asked you to donate?
23. What do you think specifically when deciding whether or not to donate and how much to donate?

### Community participation:

24. How is your connection with the gay community?
25. [Follow up: Do you know many gay men? Did you post on social media issues related to homosexuality or sexual health? Have you received other gay-oriented services before the test? Do your friends obtain relevant knowledge through you? Have you brought a friend for testing before? Have you ever been a volunteer in a gay-oriented organization? ]
  - (A) What do you think of the gay community in Guangzhou? (size of the community, activities, the feeling of involvement, impressions of gay communities, comparison of gay communities in other cities in China, etc.)
  - (B) Do you think it is important to create a gay community? Why?

(C) Do you feel there are members in the gay community that you would be able to confide in that would want to listen?

(D) Are you concerned about the health of members of the LGBTQ community?

### Psychological factors

#### Customization

26. Have you thought about whom you donated money to?

27. How do you feel about MSM who cannot afford STD testing?

28. If you have thought about it, who do you most want your money to be used for?

#### Benefits for oneself

29. Do you think participating in the "pay-it-forward" project will ultimately benefit you? If so, how will it benefit?

#### The illusion of merit/control

30. Do you believe that the donation will be rewarded?

31. Do you think the "pay-it-forward" project is a way to improve your merits?

#### Indebtedness

32. Have you enjoyed other free gay services before? (i.e. services offered to you specifically because you identify as MSM)

33. Do you think participating in the "pay-it-forward" project is an opportunity for compensation?

34. Do you feel grateful for the test that you received?

35. If you can pass on your love to specific groups (such as gay men from a certain region such as Hunan province, or other gay men with common interests or characteristics), will this make you more willing to participate in the "pay-it-forward" project?

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