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## Cryptocurrency as a new method for participant compensation in research

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### Abstract

Public health research relies heavily on participant involvement. Investigators have examined factors that affect participation and found that altruism enables engagement. At the same time, time commitment, family concerns, multiple follow-up visits, and potential adverse events are barriers to engagement. Thus, investigators may need to find new methods to attract and motivate participants to participate, including new compensation methods. As cryptocurrency is being increasingly used and accepted to pay and reimburse people for work activities, this currency should be similarly explored as an option for research participants to attempt to incentivize them to participate in studies and offer new possibilities for study reimbursement. This paper explores the potential use of cryptocurrency as a form of compensation in public health research studies and discusses the pros and cons of its use. Although few studies have used cryptocurrency to compensate participants, cryptocurrency may be used as a reward for various research tasks, including filling out surveys, participating in in-depth interviews or focus groups, and/or completing interventions. Using cryptocurrencies to compensate participants in health-related studies can provide benefits such as anonymity, security, and convenience. However, it also poses potential challenges, including volatility, legal and regulatory challenges, and the risk of hacking and fraud. Researchers must carefully weigh the benefits against the potential downsides before using them as a compensation method in health-related studies.

### Lay Summary

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Author Statements

RG helped conceive of the study concept and write the manuscript; ME helped conceive of the study and write the manuscript; SY helped conceive of the study concept and edit and review the final manuscript.

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People who participate in research are provided with compensation to reimburse them for being involved. This compensation is usually in the form of cash, check, or electronic gift cards. Given the increasing use of and interest in cryptocurrencies, such as Bitcoin and Ethereum, cryptocurrencies should be explored as a possibility for paying participants to participate in studies. This manuscript describes that compensation option, with considerations for researchers and the public.

## Keywords

cryptocurrency; participant compensation; public health; research; surveys and questionnaire; research methods; compensation; bitcoin; ethics

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## Background

Participation in research studies is essential to conduct high-quality science and improve society. However, despite efforts to recruit participants in research studies, some participants have concerns that negatively affect their willingness to participate. Such barriers have included: time commitment, family concerns, multiple follow-up visits, and risk of unknown side effects (1). Although most participants, even those who are hesitant to share personal data, welcome research participation for the benefit of society and altruistic reasons (2), many participants are motivated by incentives (3). New approaches are needed to motivate participants, including new forms of participant compensation.

Cryptocurrency is a peer-to-peer electronic cash system that bypasses a third-party arbiter to complete the transaction and is a decentralized alternative to central banking. Cryptocurrencies run on blockchain technology, are designed to be transparent, secure, immutable, and put financial control back to depositors (4). Blockchain is a decentralized, digital ledger that records all transactions in a secure and immutable way (figure 1). Smart contracts are code stored on the blockchain that get executed when a specific condition is met, for example, sending the payment on a given date, when the study is finished. There are over 9,000 cryptocurrencies in circulation (5).

## Cryptocurrency in the health domain

Health-based cryptocurrencies, or tokens, can be created by specific healthcare companies, each with a unique mission. The currencies can incentivize patients to engage in healthy behaviors; pay for medical procedures, fitness equipment, and medication; and share their medical data for research purposes. For example, stem cell coin was developed for use on projects by the Stem Cell Project, which researches stem cell treatment at hospitals and affiliate clinics (6). Developers of mobile-based health and fitness applications have written white papers proposing a similar concept of using cryptocurrencies to reward users for performing daily activities, which can then be used to pay for healthcare-related expenses (7). Although these coins are not being applied in research contexts, their health focus shows how cryptocurrencies might be used in health research settings.

Cryptocurrencies are already being used to pay research participants. One study about user experience with Bitcoin security and privacy paid study participants in Bitcoin. Participants who did not use Bitcoin before the study had to create a Bitcoin address where investigators sent the compensation. Participants were paid after completing the survey and further compensated if they successfully recruited more participants into the study. This method proved fruitful as approximately 25 percent of study participants were recruited through snowball techniques by those paid for recruiting others into the study (8). No known examples of cryptocurrency use in participant compensation have been applied in healthcare research.

Cryptocurrencies might be used in public health research to compensate for and motivate participation in health research (9). Similar to research studies that use digital forms of payment (10) and have been accepted by participants, this virtual currency could be a new form of payment extending digital payments and may incentivize participation. Cryptocurrency may be offered as a payment option after completion of surveys, participation in focus groups or one-on-one interviews, and as part of incentives for intervention studies or clinical trials. As this type of currency continues to increase in popularity, the type and field of research study this may be suited for may diversify.

### **Pros and cons of using cryptocurrency for participant payments**

There are advantages and disadvantages to offering cryptocurrency as compensation to study participants. Some benefits of using cryptocurrency go beyond usage as a form of compensation. As a novel digital payment, cryptocurrency may attract participants to research studies who may not have participated in studies previously (16). However, if offering cryptocurrency as compensation, study staff should understand how cryptocurrency works to be able to explain it to participants who may be interested in it as compensation but need to become more familiar with it. (17) Another benefit of a cryptocurrency over other forms of digital payments is smart contracts. A smart contract on blockchain technology may be used with cryptocurrency to automate participant compensation once participants complete study tasks such as surveys or questionnaires (18). Through a smart contract, the logistics of compensation are streamlined, and participants can feel confident of immediate payment after submitting their survey.

Anonymity is a significant benefit of the decentralized digital currency (19). Participants may be hesitant to reveal their personal information in many health studies, especially if they relate to sensitive topics such as substance use, mental health, or sexually transmitted infections (20). Using a cryptocurrency to compensate participants allows researchers to ensure that participants' identities are protected and that participants can remain anonymous throughout the study. Transactions on the blockchain are recorded using a public address, a string of numbers and letters, rather than a personal name or identifying information (4). This means that transactions can be tracked and audited, but the identity of the participants remains protected. Additionally, privacy-preserving cryptocurrencies, such as Monero, and Zcash, emerged based on technologies (e.g., ring signatures, stealth addresses, and zero-knowledge proofs) that can further enhance the anonymity of the transactions (21).

Using cryptocurrencies as a form of compensation for participation in health-related studies offers several benefits in terms of security and transparency. Once a transaction is recorded on the blockchain, it cannot be altered or deleted, providing a tamper-proof record of all transactions (22). Additionally, transactions on the blockchain are public and can be easily audited, providing transparency and accountability. This can be particularly useful in the context of health-related studies, where the accuracy and integrity of data are critical. NFTs allow for storing big data on the blockchain, allowing participants to have ownership over their data and monetize it in different studies (23). Another application is creating profiles that document the history of studies the participants were part of to show it as proof of eligibility for future studies (24). Using cryptocurrencies as compensation for health-related studies can provide a secure and transparent way to handle financial transactions and data management.

Furthermore, cryptocurrency can also help increase participation in health-related studies by making it more convenient for participants to receive compensation (9). Traditional compensation methods, such as checks or bank transfers, can be slow and complicated, whereas digital currency can be sent and received almost instantly. Cryptocurrencies can be easily transferred and accessed globally, regardless of geographical location or time (25). This is particularly useful for health-related studies, as it allows for a larger pool of participants from different regions, especially international participants who might not be able to receive money through the bank. This can help make participating in a study more attractive to individuals, leading to a larger and more diverse sample size.

Before implementation, investigators should weigh the considerations and challenges that this presents. One downside is that a limited number of retail businesses are currently accepting cryptocurrency. However, consumers can obtain cryptocurrency-supporting debit cards, such as those issued by Visa and Mastercard (11), which participants can take advantage of and use anywhere Visa and Mastercard are accepted. Investigators can also highlight the increasing list of vendors accepting bitcoin, such as fast-food restaurants (i.e., Burger King, Pizza Hut), technology companies (i.e., Xbox, PayPal), and beverage companies (i.e., Starbucks, Coca-Cola). Participants may also use a cryptocurrency-based company such as Bitrefill to purchase gift cards from popular retailers (i.e., Amazon, Wayfair, REI), air carriers (i.e., Southwest, Delta, American Airlines), and food delivery services (i.e., Grubhub, DoorDash) (12). Over the last few years, a small but increasing number of consumers used cryptocurrency to purchase consumer goods, from 0.6 percent in 2015 to 2.0 percent in 2018 (13). According to Jonker, retailers' intention to adopt cryptocurrency as payment is significantly associated with their assessment of consumer adoption of cryptocurrency (14). Another type of virtual asset gaining popularity is non-fungible tokens (NFT), or digital assets such as art, music, in-game items, and videos that may be purchased using cryptocurrency. Unlike cryptocurrency and physical currency, which are fungible and can be traded for each other, each NFT artwork is unique and cannot be sold or equal to one another (15).

There are several additional challenges in implementing cryptocurrencies in health research as a form of compensation. One major disadvantage of offering cryptocurrency to study participants is its limited use in retail. Though more vendors are accepting cryptocurrency

as a payment method, it pales compared to digital wallets, banking cards, and bank transfers (11). In addition, although gaining in popularity, it is still a novel currency that is relatively volatile (26). Given the many choices in currently available and traded cryptocurrencies, investigators will need to explore and research which cryptocurrency to offer their participants that potential participants will find valuable and worth their time and effort.

Additionally, participants need good internet connectivity and the knowledge to use a virtual wallet to accept and use cryptocurrency. Critics of cryptocurrency also point to its detrimental environmental impact as mining cryptocurrency has negative environmental consequences (27), which some potential participants may find objectionable. Lastly, as a novel payment, ethics committees may not eagerly support cryptocurrency as a sole form of compensation, but as a choice given to participants. It would behoove investigators to explain the concept of cryptocurrency in their review board application to maximize acceptance of use by committee members.

One of the main risks of using cryptocurrencies as a compensation method in health-related studies is the volatility of their value. Cryptocurrencies are known for their volatility, meaning their value can dramatically fluctuate over short periods (28). Such unpredictability can make it difficult for researchers to budget for compensation and for participants to plan how they will use the compensation they receive accurately. For example, if a study is planned to last for a year, and the value of the cryptocurrency increases significantly in that time, the compensation paid at the end of the study may be worth substantially less than when it was paid. On the other hand, if the value of the cryptocurrency decreases, the compensation may be worth more than expected, which could be a problem if the study budget is based on a specific matter.

Another risk of using cryptocurrencies as a compensation method in health-related studies is the risk of hacking and/or deanonymization. Risk of hacking especially concerning health-related studies where personal information may be at risk. Hackers may attempt to access the participants' digital wallets or the researchers' systems to steal the compensation (29). In addition, deanonymization can lead to uncovering the identity of the wallet holders using their I.P. address, which violates the participant confidentiality discussed in the pros section (30). To mitigate these risks, researchers should take necessary security precautions such as storing private keys in a secure location, using multi-factor authentication and implementing strict security protocols (31). Using a reputable cryptocurrency wallet or exchange is also recommended to ensure the security of transactions.

Another potential challenge of using cryptocurrencies as a compensation method in health-related studies is the legal and regulatory challenges that may arise. Cryptocurrencies are not yet fully regulated in many countries, and laws and regulations surrounding their use can vary between jurisdictions (32). This can make it difficult for researchers to ensure they operate within the law when using cryptocurrencies to compensate participants. For example, some countries may have strict laws around using cryptocurrencies that could make it illegal for researchers to use them as compensation. Additionally, the use of cryptocurrencies may be subject to taxes. The legal and regulatory environment surrounding

cryptocurrencies is still evolving, and researchers must stay informed about the latest developments to ensure they operate within the law.

## Conclusion

Though most research participants engage in studies for altruistic reasons, many are motivated by the monetary compensation they receive. Cryptocurrency may encourage and incentivize participants to get involved in research due to its novelty and rising popularity. Using cryptocurrencies to compensate participants in health-related studies can provide several benefits, such as anonymity, security, and convenience. However, despite the capacity to use it in similar ways as other digital payments, investigators may run into challenges in implementation that warrant examination, such as the volatility of cryptocurrencies, local laws regulating cryptocurrencies, and the risk of hacking. Therefore, researchers must carefully consider whether the benefits of using cryptocurrencies outweigh the potential downsides before using them as a compensation method in health-related studies.

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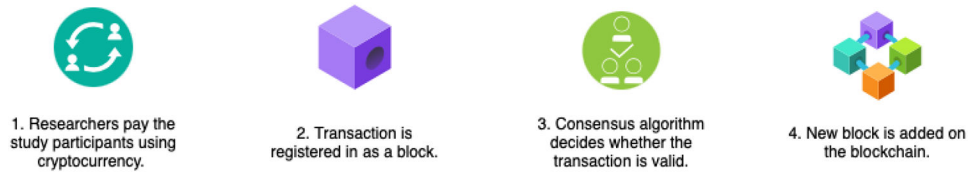
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**Highlights**

- As cryptocurrency is being increasingly used and accepted to pay and reimburse people for various work activities, this currency should be similarly explored as an option for research participants to attempt to both incentivize them to participate in studies and offer new options for study reimbursement.
- This paper explores the potential use of cryptocurrency as a form of compensation in public health research studies and discusses the pros and cons of its use.



**Figure 1.**  
*The flow of cryptocurrency transactions for compensating participants in health-related studies. Source: author's own design.*