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TABLE OF CONTENTS

Behavior blockchain for healthy cities

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Whether the Bitcoin bubble entirely bursts or not(1, 2), non-Bitcoin blockchain technology is beginning to be seen as a valuable healthcare “currency” that connects hard to reach neighborhood groups and various care organizations for prevention. Feedback design for behavioral change of high risk patients is worth its weight in gold, or rather, blockchain; and tech companies know it.

Google’s Alphabet opened their first prevention based urban design health clinic, “Cityblock,” in Brooklyn this summer, incidentally a few blocks from the innovation of “Streetcoin,” a blockchain started in the neighborhood by an unlikely group of former gang members and Harvard graduates.

Not small change, healthcare in 2017 replaced manufacturing as America’s largest employer(3) and it adds up to 17.9% of the GDP, \$3.3 trillion(4). Of this, chronic disease management contributes a sizeable sum, 75% of healthcare costs(5). A single high risk patient living on the street can run up a bill of several million dollars each year(6). Government agencies, accountable care organizations (7) such as Kaiser Permanente, and now large tech companies like Google are seeking to reach and address the behavior of high risk patients. They know that changing the behavior of even a handful of patients, creates savings of tens of millions of dollars.

However, behavioral adaptation is a complex market - individual risk factors (8) are deeply entrenched in neighborhood issues(9) and power networks(10) require an approach tailored to, or even generated by, the highest risk groups themselves. This is where “Streetcoin” comes in, a neighborhood mined blockchain feedback system that represents potential behavioral change measured and bought by care organizations for its value in healthcare savings.



ACO LANDSCAPE
(Accountable Care Organization)



LIVING LEDGER
(blockchain framework)

Accountable care organization selects high risk individuals who act as network nodes to mine "streetcoin"

As landscape is changed, health is reflected in EHR data and valued in cost savings

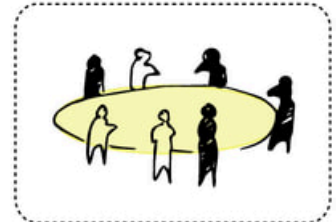


COIN MARKETPLACE
Landscape actions valued in cloud EHR data

HEALTHCARE
BLOCKCHAIN
STREETCOIN

Streetcoin unique actionable insight is bought back by ACO, which pays for landscape action

DATA MINING CIPHER
Anonymous health record data integration black box



STREETCOIN
Unique actionable insight

Behavior blockchain vs transaction blockchain



	STREETCOIN	BLOCKCHAIN: BITCOIN
<p>COIN Asset (item of property regarded as having value)</p>	<p>Digital asset based on confidential information on behavior in a network of behavioral value - this information forms insights for prevention and cost savings for healthcare.</p>	<p>Digital asset based on confidential peer to peer transactions in a network of value.</p>
<p>LEDGER Database/dataset for recording transactions (Bitcoin) or behaviors (Streetcoin)</p>	<p>"Living" database (collective health records) formed by geographically based individual and community data related to the behavior of high risk individuals and their communities.</p>	<p>Database formed by data related to peer-to-peer transactions and contracts made by the participants of the network (sellers, buyers, and miners).</p>
<p>MINING Process through which transactions / behaviors are recorded and confirmed</p>	<p>Confidential data integration cipher with high risk individuals who have a personal stake in health insights. Limiting factor is the role of the individual, resonance in their social network of risk, and the potential for change due to this resonance.</p>	<p>Process of encryption through which data related to transactions are recorded and confirmed via computer based mathematical calculations</p>
<p>BUSINESS Value creation</p>	<p>Creates value by improving collective health and well-being - cutting costs and improving care. Valuing Streetcoin is valuing neighborhood social networks; and mining Streetcoin is social action and analysis within the network, creating potentials for change among diverse and valuable actors.</p>	<p>Creates value by removing a central authority, third party, from transactions (thus reducing "transaction costs").</p>
<p>MARKET Political space in which buyers and sellers interact</p>	<p>Accountable care organizations, Medicare/ Medicaid, hospital/ insurance companies, and other agencies who value neighborhood change and are looking to cut costs.</p>	<p>Network of participants who value the exchange, (miners, sellers and buyers) and possibly the international financial sector</p>
<p>POTENTIAL Developments</p>	<p>Participation of Google's Cityblock and other agencies who aim to use urban design and construction to accommodate the risk of patient participants.</p>	<p>Lightning network; micropayment channels to scale its blockchain's capability to conduct transactions.</p>

Chart by Carlos Timo Brito and Alan Waxman

Neighborhood ledger: population geography, measurable by electronic health records

EHR CLOUD (Electronic Health Records)



ACO LANDSCAPE (Accountable Care Organization)



LIVING LEDGER (blockchain framework)

Blockchain has been gaining steam as an innovative model for health insurance (11,12,13,14,15,16), particularly stressing the importance of buy-in from high risk participants. With blockchain based data integration individuals merge their health data and their perspective into an anonymous healthcare “coin” that can be valued by a variety of insurance companies and care settings.

The base of the healthcare blockchain ledger is electronic health records and through the mining and exchange process, the ledger is constantly updated to represent adapted risk based on social network data, geography, consumer choices etc - in a word, behavior. As behavior changes by a significant group of involved individuals, so does collective risk, which means savings for insurance companies, savings represented in blockchain value.

Various companies have begun to speculate on ways to innovate this space, particularly Google and their Alphabet sponsored Cityblock (17) program, which aims to use urban design and construction to accommodate the risk of patient participants (18). Google’s Alphabet happened to have also just acquired Oscar, a government subsidized health insurance startup in NYC valued at \$3.2 billion (19). The resulting urban design, landscape and housing not only addresses health care issues (20), saving serious money for insurance companies like Oscar; it raises neighborhood real estate value over all, becoming a physical asset that improves value over time.

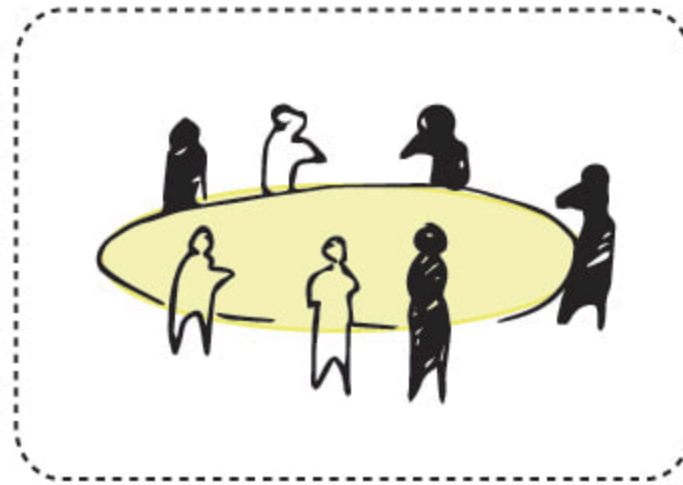


Why Healthcare Blockchain?

<p>Electronic Health Record Integration:</p>	<p>Integrates health data in meaningful, actionable, and valuable ways that are interoperable between healthcare entities (1)(3)(4)</p>
<p>Patient Directives:</p>	<p>Patient and social network node mined blockchain creates naturally strategic imperatives for patient action and clinical trials (3)</p>
<p>Provider Directory Management:</p>	<p>Updated ledger feedback in the landscape of health creates traceable provider directory management (1)(2)(3)(4).</p>
<p>Client Centric Dynamic Patient/Provider/ Insurance Relationship:</p>	<p>Blockchain is an established, patient centric currency of collective health (1)(3)(4)</p>

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3. <https://deloitte.wsj.com/cfo/2018/04/12/five-possible-uses-for-blockchain-in-health-care/>
4. <https://www.cnet.com/news/health-care-groups-use-blockchain-to-improve-provider-data/>

Cipher: data mining for streetcoin

DATA MINING CIPHERAnonymous health record
data integration black box**STREETCOIN**

Unique actionable insight

Cityblock was launched in Brooklyn in June 2018, with the help of some of the very same researchers who in the last year created Streetcoin. In Brownsville, Brooklyn, 2015, a group of formerly gang affiliated youth and Harvard graduates started working together to assess and improve urban value through design and technology. The team mined their first Streetcoin by January 2017.

Long before Cityblock and its \$21 million in venture capital (21), the neighborhood team began innovating the Streetcoin strategy. Young men from the streets of Brownsville, Tameel Marshall, Alonzo Jones, Sean Turner, and others teamed up with Harvard graduates Alan Waxman (the author), Quardean Lewis Allen (of Made in Brownsville), and Brownsville Community Justice Center (22) leaders Deron Johnston and Erica Mateo to begin addressing the prevention of violence and chronic disease through design and technological innovation. The first few collaborations were mainly focused on user interface design, social media design, and changing the atmosphere around violence in the population. These "studios," as they were called, were funded by groups like the Center For Court Innovation (23) and the Police Foundation (24) and found partners in design firms like BBDO (25) and Wolff Olins



When Alan Waxman and Ionna Jimenez were given the opportunity to start a studio in the Marcus Garvey Village side (the South side of the conflict), they jumped into action, involving a team of youth to create the first "Urban Rhythms" studio (27,28,29). The group came up with a methodology (30) to "turn up" or "turn down" collective risk through architectural intervention, inspired by Kenneth Frampton (31), who had designed their housing project over 40 years before (32). In a dramatic design review at Columbia University (33) the young men and women from The Marcus Garvey Village presented their work to Frampton in Columbia with the help of professors Kaja Kuhl (34) and Tricia Martin (35). Waxman and Jimenez continued to be funded by the Brownsville Community Justice Center to innovate. A follow up study was recently done by the Urban Institute (36) on this project.

In 2016 Alan Waxman and Tameel Marshall won a grant from Storefront For Art and Architecture (37) to follow up with the Brownsville Houses (North side of the gang conflict) and develop an innovative healthcare strategy. What resulted was a methodology for adapting risk from the inside (38). Marshall analyzed the history of the neighborhood, particularly the murderous 80s and 90s in Brownsville, as drug kingpins dominated and terrorized the streets. Over time, the "traphouse" typology began to form as a way for youths to find family-like bonds and safety in the wilderness of the streets and also work together to manage collective risk through the social network.

Participation and also reluctance and withdrawal to participate in what was sometimes called the block's "chain gang," would result in violence prevention in particularly high risk zones of gang territory. As Marshall and others described, the more time an individual spends on the street, the more time he or she comes to embody the collective risk there, and the more power they have to address that risk through behavior.

The research team, which in 2017 included Tameel Marshall, Dee Banga, John Wick, Adam Bush, and Alan Waxman, developed a spatial data integration technique to evaluate changes in the block's potential to affect collective health (39).

They call their technique of data mining a "cipher." The group gathers in a confidential HIPAA protected space to cipher, or mine, their "Streetcoin:" high risk areas in the gang territory are assessed in terms of the intensity of risk felt by the participants that day, even in that particular moment. This is discussed in terms of emotion, usually through the metaphor of music, and recorded in terms of perspective paired with biorhythms, heart and breath rate matched with geographic location. The result is a block by block framework of collective sensitivity. Data integration intensifies as the team weaves in layers of socio-economics, real estate value, crime data, etc, to create a background beat for the particular block framework in question. For the most resonant spot at the moment, the group adds lyrics, wrapping personal social network information into the data set. HIPAA protection (40) offered by the legitimizing hospital or clinic means that these personal records mint the "coin" with the biorhythms of the participants as well as the records that "chain" the community as a whole.

Each session or "cipher," as it is called, renders a data set (a Streetcoin) valued in terms of its ability to translate into insurance savings.

The Streetcoin can be read as group perspective based spatial analytics and directive map - a time stamped map of a high risk network node. Because its spatialized to the neighborhood, accountable care organizations can easily merge the data with their existing health records(41, 42, 43,44). The most valuable way to do this data integration would be to organize a cipher to further "mine" more streetcoin value from the older value, with even more high risk individuals. This is what makes the system interoperable between any health record and healthcare system.

For example, a Streetcoin mined Jan 20, 2017 with one group of relatively low risk people may only be worth very little to accountable organizations, but a Streetcoin mined Jan 30, 2017, the same day as a series of opioid overdoses that occurred in the the same network node might be worth over \$300,000 (45,46). The value depends on its resonance within the local health record ledger in terms of network prevention. In this way, Streetcoin is a way to translate health data, through mental health perspective, into actionable design, as a way of addressing public mental health challenges.

The group has continued the process for over a year under the auspices of Brookdale Hospital, producing Streetcoin for this high risk series of blocks.

For these blocks in Brooklyn that form the focus of the team's cipher, there is Streetcoin in circulation. The "currency" is in the

Streetcoin: behavior blockchain for healthcare savings

As landscape is changed,
health is reflected in EHR
data and valued in cost
savings



COIN MARKETPLACE

Landscape actions valued
in cloud EHR data

Now that programs like Cityblock and accountable care organizations have set up shop in the neighborhood, the hope is that they will buy neighborhood Streetcoin and likewise buy-into existing neighborhood social infrastructure.

Any organization with a standing ledger of neighborhood health - electronic health records (or hypothetically another standing database) - stands to gain from improved care at lower cost through the participation and insights of high risk members of their population.



making and buying Streetcoin from participants and funding action in their area of jurisdiction to translate insights into real savings.

Over time, the shared, living, ledger – and its accounting system of the electronic health records – come to represent these changes in improved health at reduced cost.

Although an organization may see the cumulative value of buying Streetcoin to understand neighborhood patterns, the value is always in the circulation of Streetcoin; transforming their analytics into prevention. In this way the idea is not to stockpile Streetcoin, but to bring high risk people together in the cipher to mine and refine Streetcoin by integrating their health data through neighborhood perspectives. The coin is timely; its value is embedded in its present potential for change in the neighborhood right now. It is only a snapshot of a network node; a node revealed in the mining process.

As most cryptocurrency is increasingly being seen as a technological fad, it's time to invest in blockchain applications that have visible and valuable results. Streetcoin is not about speculative wealth; it's about tangible value in existing communities.

How to make Streetcoin:

Streetcoin: resulting integrated unique data set from the cipher mining process, with valuable health insights for prevention and cost savings for health insurance

Living (Blockchain) Ledger: the geography of high risk zone tied to a population set and social network, the neighborhood

Data Mining Cipher: HIPAA protected data integration cipher with high risk individuals who have a personal stake in health insights

Coin Marketplace: Coin Marketplace: Accountable Care Organizations, Medicare/Medicaid, agencies like Cityblock, and other groups

Acknowledgments

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[Click here](#) to read an economist's response to this paper

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About the Author



Alan Waxman MLA creates ecosocial design for health equity and cultural resiliency. By operating in locations of fragility in space and time, he aims to bring people together to reopen critical narratives. His Urban Rhythms studios with Mark Morris Dance Group, the Center For Court Innovation, and other partners, have assessed urban patterns by way of participatory engagement; setting up emic spectrums of data derived from meaning for cultural insiders. Resident participants, those who have the most to gain and the most to lose, collaborate to make real time interventions through events, dance, and environmental change. As "[Neighborhood Doctor](#)," Waxman has deployed ecosocial design in Brownsville, Brooklyn NY and Kyoto, Japan, where he served as an instructor with the University of Oregon in their [Myoshinji Zen temple based urban design program](#). In public space design he works as a designer at SWA in San Francisco, creating parks and plazas mostly in the United States and China.

[TABLE OF CONTENTS](#)



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