

LSE

THE LONDON SCHOOL  
OF ECONOMICS AND  
POLITICAL SCIENCE ■

# LSE Research Online

## Matthew J. Renwick and [Elias Mossialos](#) Crowdfunding our health: economic risks and benefits

Article (Accepted version)  
(Refereed)

**Original citation:**

Renwick, Matthew J., Mossialos. (2017) *Crowdfunding our health: economic risks and benefits*. [Social Science & Medicine](#). ISSN 0277-9536

DOI: [10.1016/j.socscimed.2017.08.035](https://doi.org/10.1016/j.socscimed.2017.08.035)

Reuse of this item is permitted through licensing under the Creative Commons:

© 2017 The Authors CC BY-NC-ND 4.0

This version available at: <http://eprints.lse.ac.uk/84165/>

Available in LSE Research Online: September 2017

LSE has developed LSE Research Online so that users may access research output of the School. Copyright © and Moral Rights for the papers on this site are retained by the individual authors and/or other copyright owners. You may freely distribute the URL (<http://eprints.lse.ac.uk>) of the LSE Research Online website.

# Accepted Manuscript

Crowdfunding our health: Economic risks and benefits

Matthew J. Renwick, Elias Mossialos

PII: S0277-9536(17)30516-6

DOI: [10.1016/j.socscimed.2017.08.035](https://doi.org/10.1016/j.socscimed.2017.08.035)

Reference: SSM 11375

To appear in: *Social Science & Medicine*

Received Date: 13 November 2016

Revised Date: 9 June 2017

Accepted Date: 28 August 2017

Please cite this article as: Renwick, M.J., Mossialos, E., Crowdfunding our health: Economic risks and benefits, *Social Science & Medicine* (2017), doi: [10.1016/j.socscimed.2017.08.035](https://doi.org/10.1016/j.socscimed.2017.08.035).

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



# Crowdfunding our health: economic risks and benefits

Matthew J. Renwick<sup>1</sup> & Elias Mossialos<sup>1</sup>

<sup>1</sup>LSE Health, Department of Social Policy, London School of Economics and Political Science, London, United Kingdom

Corresponding author:  
Professor Elias Mossialos  
Director, LSE Health, London School of Economics  
Email: [e.a.mossialos@lse.ac.uk](mailto:e.a.mossialos@lse.ac.uk)  
Telephone: +44 (0)20 7955 7564

Running head: Crowdfunding our health

Keywords: crowdfunding / alternative financing / health policy / health economics / global health

**1 ABSTRACT**

2

3 Crowdfunding is an expanding form of alternative financing that is gaining traction in the  
4 health sector. This article presents a typology for crowdfunded health projects and a  
5 review of the main economic benefits and risks of crowdfunding in the health market.  
6 We use evidence from a literature review, complimented by expert interviews, to extend  
7 the fundamental principles and established theories of crowdfunding to a health market  
8 context. Crowdfunded health projects can be classified into four types according to the  
9 venture's purpose and funding method. These are projects covering health expenses,  
10 fundraising health initiatives, supporting health research, or financing commercial health  
11 innovation. Crowdfunding could economically benefit the health sector by expanding  
12 market participation, drawing money and awareness to neglected health issues,  
13 improving access to funding, and fostering project accountability and social  
14 engagement. However, the economic risks of health-related crowdfunding include  
15 inefficient priority setting, heightened financial risk, inconsistent regulatory policies,  
16 intellectual property rights concerns, and fraud. Theorized crowdfunding behaviours  
17 such as signalling and herding can be observed in the market for health-related  
18 crowdfunding. Broader threats of market failure stemming from adverse selection and  
19 moral hazard also apply. Many of the discussed economic benefits and risks of  
20 crowdfunding health campaigns are shared more broadly with those of crowdfunding  
21 projects in other sectors. Where crowdfunding health care appears to diverge from  
22 theory is the negative externality inefficient priority setting may have towards achieving  
23 broader public health goals. Therefore, the market for crowdfunding health care must be

24 economically stable, as well as designed to optimally and equitably improve public  
25 health.

26

27 **Key words**

28 Crowdfunding, alternative financing, health policy, health economics, global health

ACCEPTED MANUSCRIPT

## 29 INTRODUCTION

30

31 Crowdfunding has recently emerged as an innovative method of financing ventures that  
32 fall outside the purview of traditional capital markets (infoDev, 2013; Kirby & Worner,  
33 2014). Crowdfunding is an alternative channel for financing a project that uses an online  
34 platform to solicit generally small contributions from numerous participants (i.e. the  
35 crowd). Crowdfunding is increasingly being used to bankroll health-related campaigns  
36 (Moran, 2017; "Mind the gap", 2017; Young & Scheinberg, 2017).

37

38 Crowdfunding in the health market presents unique economic applications, benefits,  
39 and risks, which have been inadequately explored. The purpose of this article is to  
40 formulate a helpful typology for crowdfunded health campaigns and review the broad  
41 economic benefits and risks of crowdfunding in the health market. Our typology and  
42 assessment aims to equate the fundamental principles and theory of crowdfunding with  
43 evidence and examples of health-related crowdfunding. This process was informed by a  
44 rapid evidence review and from interviews with selected experts on crowdfunding.

45

## 46 BACKGROUND

47

48 The fundamental principles and theory of crowdfunding, discussed below, guided the  
49 methodological development of our literature search and interview questions. In  
50 addition, these principles and theoretical lenses provide the sensitizing and inductive  
51 devices used in our empirical analysis.

52

53 **Fundamental principles of crowdfunding**

54

55 A crowdfunding transaction involves three key players: the project initiator who is  
56 seeking the funding, the funders who are offering the financing, and the platform  
57 provider who is linking the project initiator with funders through an online forum (Kuti,  
58 2014). The project initiator is not always the beneficiary of the funding and may act as a  
59 representative for another individual. What separates crowdfunding from more  
60 traditional financing mechanisms is the online forum, which provides a uniquely  
61 accessible method of allowing average people to participate in the funding process and  
62 allowing small- and medium-sized enterprises (SMEs) to seek funding external from  
63 banks.

64

65 Three funding models typically characterize crowdfunding: reward-based, donation-  
66 based, and investment-based. Reward-based crowdfunding asks funders to contribute  
67 money in return for prizes (Belleflamme, Omrani, & Peitz, 2015). Donation-based  
68 crowdfunding involves participants offering philanthropic contributions to a project  
69 (Belleflamme et al., 2015). Finally, investment-based crowdfunding is characterized by  
70 participants providing financing through high-interest loans or in return for an equity-  
71 stake in the company (Belleflamme et al., 2015). These tend to be much larger projects  
72 as they present earning potential for funders.

73

74 Well known crowdfunding platforms include Kickstarter, GoFundMe, Indiegogo,  
75 Crowdcube, and FundRazr. According to Massolution (2015), a US research firm, there  
76 are over 1250 crowdfunding platforms around the world, raising US \$16.2 billion in  
77 2014, up 167% from US \$6.1 billion the previous year. Massolution estimated that this  
78 growth rate will have held for 2015 with expected crowdfunding volumes to reach US  
79 \$34.4 billion by 2016. This progress is generated from growing uptake in North America  
80 and Europe as well as significant growth in Asia. The global crowdfunding market could  
81 be further augmented by up to US \$96 billion, unlocked from emerging economies in  
82 Africa, Asia, and South America (infoDev, 2013). While dwarfed by the trillions of dollars  
83 financed through traditional capital markets, these figures demonstrate a growing and  
84 formidable niche market in the financial world (Belleflamme et al., 2015).

85

### 86 **Crowdfunding theory**

87

88 Behavioural and economic theory can aid in understanding the recent rise of  
89 crowdfunding, the main benefits from participating, and possible market failures.  
90 According to Agrawal, Catalini, and Goldfarb (2014), crowdfunding has developed as a  
91 result of the commercialization of modern-day Internet. Web 2.0 has lowered the  
92 transaction costs and financial risks of crowdfunding to the point where it is an  
93 economically viable method of financing small ventures. For instance, the Internet  
94 lowers search costs by facilitating cheap, effective, and efficient matching of funders  
95 and project initiators (Agrawal, Catalini, & Goldfarb, 2014). Communication costs are  
96 also lower, allowing funders to easily gather information, monitor their investment, and



97 engage with the project initiator, regardless of their geographic location (Agrawal et al.,  
98 2014). In addition, the large number of funders accessible through the Internet allows a  
99 project's risk to be spread over many contributors and permits funders to contribute  
100 small denominations (Agrawal et al., 2014).

101  
102 In some circumstances, market participants may prefer crowdfunding over traditional  
103 funding sources (Agrawal et al., 2014). From the project initiator's perspective,  
104 crowdfunding can lower the cost of accessing capital by: matching project initiators with  
105 funders that have the highest willingness to pay; bundling multiple project goals  
106 together; and generating valuable social media attention. Project initiators may also  
107 view crowdfunding as a way of engaging their customer base and accessing valuable  
108 market information from funders such as customer preferences (Agrawal et al., 2014;  
109 Gerber & Hui, 2013). Funders may participate because they can access affordable  
110 investment opportunities without being an accredited investor, acquire products before  
111 mainstream uptake, participate in the crowdfunding community, support a project that is  
112 important to them, and formalize their contribution through a reputable platform  
113 (Agrawal et al., 2014). The crowdfunding platforms themselves are motivated by the  
114 profit potential generated from nominal and percentage transaction charges on  
115 contributions (Agrawal et al., 2014; Belleflamme et al., 2015).

116  
117 However, the market for crowdfunding is susceptible to market inefficiencies that may  
118 impede economically valuable transactions or even cause market failure. The primary  
119 dilemma appears to be asymmetrical information (Agrawal et al., 2014; Belleflamme et

120 al., 2015; Belleflamme & Lambert, 2014; Schweinbacher & Larralde, 2012). In reality,  
121 the project creator will know more about the project than the funder. This discrepancy in  
122 information availability is amplified in the crowdfunding setting. Project initiators are  
123 often geographically isolated from their funders whom are often inexperienced in the  
124 project field (Agrawal et al., 2014; Agrawal, Catalini, & Goldfarb, 2015). Thus, the  
125 relationship between funders and the project initiator is described as that of a principal  
126 and agent (**Figure 1**) (Ley & Weaven, 2011). The project initiator (i.e. the agent) is  
127 essentially paid to carry out the project's stated goals on behalf of the funders (i.e. the  
128 principal).

129  
130 Two chief negative outcomes can arise from a principal-agent relationship: moral  
131 hazard and adverse selection (Agrawal et al., 2014). Moral hazard would describe a  
132 situation where a project initiator acts in self-interest and fails to deliver on project goals  
133 (Agrawal et al., 2014; Strausz, 2016). Given the nature of crowdfunding, funders cannot  
134 easily hold the initiator accountable or may not be privy to information regarding the  
135 project's progress and success. Adverse selection might occur when high-quality project  
136 initiators consistently choose to access funding through more traditional avenues like  
137 banks, leaving only low-quality ventures in the crowdfunding market pool (Agrawal et  
138 al., 2014). Both moral hazard and adverse selection could drive funders out of the  
139 market. Consequently, signalling is an important aspect of crowdfunding (Belleflamme  
140 et al., 2015). Project initiators will actively signal to potential investors that they have a  
141 high-quality campaign and are committed to fulfilling their stated long-term goals by

142 promoting on social media, brandishing past successful projects, and offering prizes to  
143 early contributors.

144

145 Herding behaviour is another consequence of information asymmetry that has been  
146 observed in the crowdfunding market (Agrawal et al., 2014; Belleflamme et al., 2015; E.  
147 Lee & Lee, 2012). Herding occurs when funders collectively make inferences about  
148 project quality based on decisions of other funders. There is a tendency for funders to  
149 swarm projects that are receiving strong support because the crowd perceives these  
150 projects to be higher quality. Several studies suggest that herding behaviour in  
151 crowdfunding can lead to efficient outcomes in certain circumstances (Burtch, Ghose, &  
152 Wattal, 2013; Freedman & Jin, 2008; J. Zhang & Liu, 2012), while another study found  
153 that irrational herding dominates the market (Chen & Lin, 2014). Herding is particularly  
154 problematic when collective funder decisions are made at the expense of conducting  
155 individual due diligence. A free-rider scenario could arise when funders choose to  
156 postpone funding until a project has been vetted by early contributors and reached a  
157 certain threshold indicating quality (Agrawal et al., 2014; Belleflamme et al., 2015;  
158 Boudreau, Jeppesen, Reichstein, & Rullani, 2015). The market could fail if everyone  
159 acts as a free-rider resulting in no projects being fully funded.

160

## 161 **RESEARCH METHODOLOGY**

162

163 Our research has two key objectives: determine how crowdfunding is applied in the  
164 health sector and assess the important economic benefits and risks of crowdfunding in

165 the health market. Our research methodology was a rapid evidence review of peer- and  
166 non-peer reviewed literature that was supplemented with targeted interviews with  
167 crowdfunding experts. The literature search and interview questions were informed and  
168 directed by the principles and theories of crowdfunding discussed above.

169  
170 We reviewed peer-reviewed articles with use of EconLit, MEDLINE (PubMed), Embase  
171 (Ovid), Scopus, and Web of Science. We used the following search terms across the  
172 above databases: “crowdfund”, “theory”, “model”, “platform”, “reward”, “donation”,  
173 “investment”, “equity”, “loan”, “market failure”, “principle-agent”, “information  
174 asymmetry”, “moral hazard”, “adverse selection”, “herd”, “signal”, “output”, “impact”,  
175 “benefit”, “risk”, and “challenge”.

176  
177 The search was restricted to papers published between January 1, 2006 and May 10,  
178 2017, in English, and either journal articles, comments, editorials, or reviews. Following  
179 the initial compilation of search results and removal of duplicates, we further excluded  
180 papers that did not centrally focus on the topic of crowdfunding. Our search identified a  
181 total of 281 unique peer-reviewed papers focusing on crowdfunding.

182  
183 A selection of non-peer reviewed literature was incorporated and identified through a  
184 Google search and from citations in key papers. In total, 51 non-peer reviewed texts  
185 were included and consisted of policy documents, working papers, conference  
186 presentations, and consulting reports. Upon reviewing 332 relevant documents, 43 texts  
187 were identified as specifically discussing health-related crowdfunding (**Supplementary**

188 **Material**). Finally, a review of 25 key crowdfunding websites was conducted to link real  
189 world examples to the literature and theory.

190  
191 We performed a series of hour-long telephone interviews with experts in the field of  
192 crowdfunding to validate and complement our conclusions drawn from the literature  
193 review. We used a combination of convenient and judgment sampling to select  
194 interviewees that were accessible and would have professional insight into the political  
195 and regulatory environment of crowdfunding (Marshall, 1996). We chose crowdfunding  
196 policy experts from the US and UK, as these are the two largest crowdfunding markets.  
197 In addition, we solicited input from the OECD to gain a global policy perspective and the  
198 European Crowdfunding Network to gather an industry perspective. Five out of the nine  
199 contacted experts were interviewed. We employed a semi-structured interview protocol  
200 **(Supplementary Material)** that covered the benefits and challenges of health-related  
201 crowdfunding, the role of regulations and policy, and future market prospects. We then  
202 allowed for unstructured dialogue of relevant topics. We did not believe it was beneficial  
203 for this exploratory review to conduct a larger, systematic interview process of  
204 stakeholders. Due to our small sample size, we did not use a coding system for  
205 interpreting the interviews.

206

## 207 **RESULTS**

208

### 209 **A typology for crowdfunding in the global health sector**

210

211 Based on our review, we propose a typology for crowdfunded health projects, which can  
212 be classified into four categories based on the purpose and funding-type of the project  
213 (**Table 1**). The first can be termed health expenses, which are donation-based  
214 campaigns to fund out-of-pocket expenses for patients unable to afford particular  
215 medical services or products (Sisler, 2012). Examples of crowdfunded health expenses  
216 include cataract surgery, chemotherapy, motorized wheelchairs, and household  
217 accessibility adaptations. GoFundMe, one of the largest donation-based crowdfunding  
218 forums in the world, raised US \$147 million for medically-related projects in 2014, up  
219 from US \$6 million in 2012 (Cunha, 2015). Their health section for donations is the  
220 platform's most popular category and generated 26% of all donations in 2014.

221  
222 The second type are not-for-profit health initiatives that include fundraising for medical  
223 institutions or charitable organizations, patient education programs, disease awareness  
224 campaigns, and global health missions. Contributions to these crowdfunded campaigns  
225 are typically incentivized through donations or offering rewards. A particularly well-  
226 known instance of a crowdfunded health initiative is the 2014 Ice Bucket Challenge,  
227 which supported patients with amyotrophic lateral sclerosis. The project raised over  
228 \$115 million towards the ALS Association and Motor Neuron Disease Association  
229 (Chakradhar, 2015).

230  
231 The third classification is health research. There is an emerging trend for health  
232 scientists to directly crowdfund donations for their not-for-profit research work (P. P.  
233 Cameron, 2013; Kaplan, 2013; Ozdemir, J, & S, 2015; Otero, 2015; Perlstein, 2013;

234 Philippidis, 2013; Vachelard, Gambarra-Soares, Augustini, Riul, & Maracaja-Coutinho,  
235 2016; Wheat, Wang, Byrnes, & Ranganathan, 2013). Crowdfunding, alongside  
236 crowdsourcing, has supported valuable scientific breakthroughs in understanding  
237 human metagenomics and microbiome dynamics (Debelius et al., 2016). Oncology  
238 research has been another major focus for crowdfunding efforts with a number of  
239 platforms dedicated to cancer-specific crowdfunding (Dragojlovic & Lynd, 2014).

240

241 Finally, innovative health care ventures that have commercial potential could access  
242 capital through investment-based, typically equity, crowdfunding. Pharmaceutical and  
243 biotech SMEs as well as spin-off companies from university research groups are using  
244 platforms such as Crowdcube and ShareIn to sell equity stakes in their company in  
245 return for capital (Fiminska, 2015). This money may be used to accelerate clinical  
246 testing and development of a novel therapy, expand health service offerings, or scale-  
247 up production and operations for a medical product.

248

#### 249 **Economic benefits of health-related crowdfunding**

250

251 We identified four major economic benefits of health-related crowdfunding: expanding  
252 market participation, increasing funding access for individuals and SMEs, drawing  
253 awareness and funding to neglected issues, and improving social engagement. **Table 2**  
254 summarizes these benefits across the four types of health-related crowdfunding.

255

256 *1. Expands funder participation in the health market*

257  
258 Crowdfunding appears to support and magnify systems of economic sharing on local,  
259 national, and global stages by breaking down institutional barriers and encouraging  
260 active participation (Share the World's Resources, 2014). Light and Briggs argue (2017)  
261 that "crowdfunding platforms collectively change the economic landscape and  
262 enfranchise new pockets of society to contribute and see their choices enacted."  
263 Therefore, rather than redirecting funds through a different financing avenue, health  
264 crowdfunding may leverage globalization and capture new funding that would not have  
265 existed. Snyder et al. (2016) suggests that "compared to the experience people have  
266 when giving or considering donations to a large charitable organization, an individual's  
267 medical crowdfunding initiative can feel much more personal and compelling, leading to  
268 giving that would not have occurred otherwise." In addition, more inclusive regulations  
269 for investment-based crowdfunding are increasingly permitting non-accredited investors  
270 to participate in the private equity market for biotech companies (Moran, 2017). A 2015  
271 Biocom report estimates that there are over 100 million non-accredited US investors  
272 who could potentially participate in this venture capital market (M. Cameron, Flach,  
273 MacDonald-Korth, Manaktala, & Walker, 2015).

274

## 275 *2. Improves individual and SME access to financial support*

276

277 Crowdfunding may improve general access to financial support for SMEs and  
278 individuals (Valančienė & Jegelevičiūtė, 2013). A 2014 UK industry report found that  
279 64% of those who raised money through a donation-based campaign indicated that it



280 was 'unlikely' or 'very unlikely' they would have been able to access funds if alternative  
281 financing was not available (Baeck, Collins, & Zhang, 2014). Similarly, 53% of those  
282 using reward-based campaigns thought obtaining financing through traditional methods  
283 would have been 'unlikely' or 'very unlikely'. The benefit of improved access to funding  
284 is evident in the health sector. In the US, medical expenses were the leading cause of  
285 bankruptcy in 2014 (Himmelstein, Thorne, Warren, & Woolhandler, 2009).  
286 Crowdfunding now averts between an estimated 114 and 136 bankruptcies per quarter  
287 in the US, representing 3.9% of total bankruptcies caused by medical expenses (Burtch  
288 & Chan, 2015). A higher proportion of these US medical expense campaigns are hosted  
289 by patients located in states without the Affordable Care Act Medicaid expansion  
290 (Berliner & Kenworthy, 2017). Moreover, according to the 2015 Biocom analysis of life  
291 science crowdfunding, biotech companies are increasingly relying on investment-based  
292 crowdfunding as a means of raising capital (Wirsching, Laqua, & Colthorpe, 2015).  
293 Between 2010 and 2015, a total of 42 European biotech companies raised €23 million  
294 through crowdfunding. The average amount raised by these companies was €550,000  
295 and multiple companies raised over €1 million. This is a significant trend upwards from  
296 2010 when the average equity-based life science campaign raised €127,000. Some of  
297 these SMEs state that they would not have been able to raise this capital and start their  
298 company without access crowdfunding.

299

300 *3. Draws awareness and funding to neglected health issues*

301

302 In the health sector, rare diseases can sometimes be neglected by traditional financing  
303 sources. Crowdfunding may help pull money into these unique funding gaps. A 2016  
304 Pew Research Centre survey found that 84% of donors believe that crowdfunding  
305 “highlights causes or businesses that might not get much attention otherwise ”(Smith,  
306 2016). For instance, GoFundMe’s largest campaign to date raised more than USD \$2  
307 million from over 37,000 donors around the world to support a young girl with a very  
308 rare neurological condition, Sanfilippo Syndrome Type A (Young & Scheinberg, 2017).  
309 Additionally, crowdfunding may fill holes in health research agendas by funding niche or  
310 high-risk health science fields. There is building evidence to suggest that crowdfunding  
311 may be an effective method for bringing scientists and donors together to finance early  
312 stage clinical trials targeting rare and neglected diseases (Dragojlovic & Lynd, 2014;  
313 Hawkes & Thomson, 2015; Sharma, Khan, & Devereaux, 2015). Crowdfunding proof-of-  
314 concept research and initial clinical trials could allow scientists to attain more substantial  
315 grant funding or entice private investment (Dragojlovic & Lynd, 2014; Orelli, 2012).

316

#### 317 *4. Improved social engagement*

318

319 In the article “A guide to scientific crowdfunding”, Vachelard et al. (2016) recommend  
320 that engaging the public and their contributors is critical to a campaign’s success. The  
321 most effective initiators tend to provide frequent project updates, reply to funder  
322 inquiries, and harness the power of social media (Belleflamme, Lambert, &  
323 Schwienbacher, 2013; Vachelard et al., 2016). On the other side, funders can see how  
324 the project is progressing, provide input where possible, and monitor the project’s

325 practices. Social networks of funders create a community around various projects that  
326 can quickly spread awareness and signal legitimacy to new contributors (Belleflamme et  
327 al., 2015; Lehner & Nicholls, 2014). Moreover, funder feedback delivers early-stage  
328 market testing for those projects that have a product or service output (Belleflamme et  
329 al., 2015). In the health sector, transparency and social engagement are particularly  
330 powerful because funders often have a personal connection with the individual, issue or  
331 business being financed (Smith, 2016). This intrinsic connection fosters openness and  
332 accountability in the crowdfunding relationship (Perlstein, 2013).

333

### 334 **Economic risks of health-related crowdfunding**

335

336 Based on our review, we have highlighted five economic risks related to crowdfunding  
337 health projects: inefficient priority setting, financial risks, unclear regulatory frameworks,  
338 issues of accountability, transparency, and due diligence, and risk of fraud and money  
339 laundering. **Table 2** summarizes these concerns across the four types of health-related  
340 crowdfunding.

341

#### 342 *1. Inefficient health priority setting*

343

344 Crowdfunding may be an inefficient method of health priority setting and allocation of  
345 financing because decisions may be determined by funder sentiment and swayed by  
346 behavioural economic principles such as signalling and herding (Agrawal et al., 2014;  
347 Belleflamme et al., 2015). An increasing number of life science researchers and patients

348 are turning to social media to solicit donations and attention for their campaign (Berliner  
349 & Kenworthy, 2017; Vachelard et al., 2016). The success of a research project or  
350 medical expense campaign is often largely based on an initiators ability to tap social  
351 networks (Barclay, 2012; Byrnes, et al., 2014). There is concern that this may come at  
352 the cost of determining health research financing based on scientific merit or health care  
353 funding based on clinical need (Del Savio, 2017; Snyder, 2016). Moreover, allowing  
354 patients to crowdfund or pay to participate in clinical trials poses an especially difficult  
355 ethical and economic dilemma. Patients may tend to support the short-term goals of a  
356 new intervention at the potential expense of longer-term medical evidence production  
357 (Wenner, Kimmelman, & London, 2015). In addition, crowdfunded clinical trials may not  
358 go through the same rigorous peer-review process as publicly funded trials to validate  
359 preclinical evidence (Wenner, Kimmelman, & London, 2015).

360

## 361 *2. Financial risks*

362

363 An increasing number of countries are amending regulations to allow non-accredited  
364 investors to participate in investment-based crowdfunding (Cusmano, 2015; Hemmadi,  
365 2015). However, introducing non-accredited investors to private equity investing and  
366 lending may expose inexperienced retail investors to more financial risk than they are  
367 aware (Kirby & Worner, 2014; Pazowski & Czudec, 2014). Start-up businesses seeking  
368 equity investment often have failure rates between 75% and 90% in the first five years  
369 (Hemmadi, 2015). Crowdfunded loans are often unsecured and there is minimal liquidity

370 in the investment-based crowdfunding market, which has no secondary market  
371 (Hemmadi, 2015).

372

373 Financial risks also apply to donation- and reward-based crowdfunding campaigns  
374 where there is the possibility that a backed project does not produce its projected goal.  
375 Kickstarter, a reward-based platform, noted that 25% of start-up projects failed in the  
376 first year, 55% failed by year 5, and 71% failed by year 10 (“Investors navigate the risks  
377 of crowdfunding,” 2015). In cases where reward-based projects do not actually fail, the  
378 majority of campaigns do not deliver their reward on time. A 2014 study of 48,500  
379 crowdfunded projects found that over 75% delivered their products later than originally  
380 promised (Mollick, 2014).

381

382 Another financial concern is that transaction fees levied by platform providers may be a  
383 source of economic inefficiency. Investment-based crowdfunding platforms typically  
384 charge around 5% on funds raised, which is in line with what major banks charge on  
385 initial public offerings (5 – 7%) (Belleflamme et al., 2015; PricewaterhouseCoopers,  
386 2012). However, some donation-based and reward-based crowdfunding platforms seem  
387 to charge higher transaction fees on funds raised. For example, GoFundMe has a 5%  
388 participation fee, a 2.9% processing fee, and a flat 30 cent charge on all donations  
389 (Belleflamme et al., 2015). An average \$10 donation with GoFundMe would incur a  
390 10.9% charge. Kisskissbankbank, a popular French platform, charges a 5% commission  
391 plus a 3% bank fee, creating a total transaction fee of 8% (Belleflamme et al., 2015).

392

393 *3. Unclear regulatory framework*

394

395 Existing regulatory definitions of crowdfunding appear to be ill-defined and there is little  
396 consensus among policy-makers regarding what should fall under existing and future  
397 crowdfunding regulation (INT-2, INT-3) (Cusmano, 2015). All the interviewed experts  
398 could not specify a country that employed a particularly enabling policy environment for  
399 crowdfunding that could guide future regulation development (INT-1, INT-2, INT-3, INT-  
400 4, INT-5). Regulators may be operating with limited knowledge and experience (INT-2,  
401 INT-3) and risk applying the wrong policy frameworks to differing crowdfunding models.  
402 This confusion is particularly evident with regards to peer-to-peer lending and  
403 crowdfunding securities, which often fall under the same regulations (European  
404 Crowdfunding Network, 2014).

405

406 Determining appropriate regulations for equity-based crowdfunding appears to be  
407 particularly challenging given its potential for economic impact (INT-1, INT-5). Important  
408 regulatory considerations include the size of equity offerings, capital requirements,  
409 registration with the national licensing authority, the number of investors per offer,  
410 restrictions on who can invest, and controls on how much they can invest (Kirby &  
411 Worner, 2014). Moreover, a common set of legal frameworks has not been established  
412 across borders (European Crowdfunding Network, 2014; Gabison, 2015). Countries  
413 frequently have divergent taxation and tax incentivization schemes for international  
414 platforms (European Commission, 2014). Finally, it is unclear the degree of liability

415 international platform providers hold for screening risky, incompetent, unethical, or  
416 illegal projects (INT-2, INT-3).

417

418 These challenging questions are being discussed by government agencies like the  
419 European Commission, US Securities and Exchange Commission, UK Financial  
420 Conduct Authority, the Ontario Securities Commission, and the Australian Corporations  
421 and Markets Advisory Committee (Cusmano, 2015; Wirsching et al., 2015). There does  
422 not appear to be a practical role for a global crowdfunding regulator, but it seems that  
423 there is a trend towards international harmonization of crowdfunding regulation (INT-1,  
424 INT-2, INT-3). Large multinational banks, who perceive the crowdfunding market to  
425 have an unfair advantage over traditional capital markets, are responsible for increasing  
426 pressure and lobbying of regulators to further limit crowdfunding (INT-2, INT-3). Despite  
427 this, large banks are entering the crowdfunding space, which has benefited from years  
428 of low regulation.

429

430 The increasing regulation of the equity crowdfunding market is spilling into the non-  
431 investment markets. In the US, there are currently no specific policies or laws that  
432 govern donation- and reward-based crowdfunding (INT-1). But, the Federal Trade  
433 Commission and Association of United States Attorneys is now exploring ways to  
434 respond to the growing incidence of fraud on donation- and reward-based platforms  
435 (INT-1).

436

437 *4. Issues of accountability, transparency, and due diligence*

438

439 The anonymity, geographic distance, and information asymmetry between funders and  
440 project initiators makes it challenging to ensure accountability, transparency, and due  
441 diligence across all projects (Agrawal et al., 2014; Kirby & Worner, 2014). Much of this  
442 responsibility falls on project initiators to provide necessary information to contributors  
443 and to fulfil the project's stated objectives (Agrawal et al., 2014). However, project  
444 initiators can avoid their responsibilities and there is a risk that contributors could lose  
445 their capacity to hold initiators accountable. Even when project information is made  
446 readily available, project goals can be vague or have unclear metrics on which  
447 contributors can gauge project progress or success. In addition, the average  
448 contribution is often small thereby reducing individual contributors' incentive to hold  
449 initiators accountable (Agrawal et al., 2014). Platform providers are increasingly  
450 expected to provide some screening, rule setting, and information to protect contributors  
451 from incompetent project initiators and to help contributors make informed decisions  
452 (Belleflamme et al., 2015).

453

454 An important issue related to transparency is intellectual property rights. Crowdfunded  
455 health and biotechnology start-ups are at risk for having their intellectual property stolen  
456 or plagiarized by others on the Web (European Commission, 2014). In the US, Title III  
457 of the JOBS Act requires equity-based crowdfunded projects to disclose detailed reports  
458 of company operations and finances to its investors (112th US Congress, 2012). The  
459 project initiator must therefore balance their responsibilities of disclosure with the  
460 dangers of divulging proprietary information or company details to market competitors



461 (Adams & Constantine, 2015). There is concern that disclosure of any proprietary  
462 information to funders may constitute as prior art, thus barring the initiator from claiming  
463 patent rights in the future (Adams & Constantine, 2015). While there are exemptions in  
464 the US that would allow project initiators to patent their invention post-crowdfunding,  
465 many foreign patent systems do not have the same leniencies (INT-2). Finally, it is  
466 important to recognize the expansive trademark and copyright entitlements platform  
467 providers attain through hosting a campaign (Adams & Constantine, 2015).

468

#### 469 *5. Risk of fraud and money laundering*

470

471 Online crowdfunding leaves contributors susceptible to fraud because traditional legal  
472 and reputation security measures may not work (Gabison, 2015). There have been  
473 several legal cases against crowdfunders whom fraudulently collected donations for a  
474 medical condition they did not have (Snyder, 2016). The relatively small average  
475 contribution and anonymity of the project initiator disincentivizes legal action in the  
476 event of fraudulent behaviour (Agrawal et al., 2014). Also, initiators often do not have  
477 the same traditional motivation to protect their reputation and goodwill because they are  
478 anonymous and frequently one-off participants. There appears to be some risk for  
479 money laundering, which could support narcotics deals, terrorism, and other illegal  
480 activities (Robock, 2014). Both fraud and money laundering seem to be rare and do not  
481 significantly discourage people from participating in crowdfunding (European  
482 Commission, 2014). Nonetheless, states are working to further develop anti-fraud and  
483 anti-money laundering safeguards (INT 01) (European Commission, 2014).

484

485 **DISCUSSION**

486

487 Health policy makers need to be aware of and understand the growing economic impact  
488 of health-related crowdfunding. Countries will likely continue to embrace health-related  
489 crowdfunding because it expands health market participation, improves individual and  
490 SME access to funding, pulls funding to neglected health issues, and encourages  
491 project accountability and community engagement. Regulators in North America and  
492 Europe are working to delineate regulatory systems that integrate crowdfunding into  
493 their existing financial markets (European Crowdfunding Network, 2014). However,  
494 policy makers are faced with market risks that could impact the health sector such as  
495 inefficient priority setting, heightened financial risk, inconsistent regulatory policies,  
496 intellectual property rights concerns, and fraud. Self-regulation within the crowdfunding  
497 community may serve to compliment formal policy. Professional accreditation (e.g.  
498 Crowdfunding Accreditation for Platform Standards) and systems for tracking fraudulent  
499 campaigns exist (e.g. [www.gofraudme.org](http://www.gofraudme.org)), however these programs do not seem  
500 widely recognized or utilized.

501

502 Crowdfunding theory and the principle-agent relationship are useful tools for  
503 understanding crowdfunding in the health sector. Theorized crowdfunding behaviours  
504 such as signalling and herding are likely present in the market for crowdfunding health.  
505 In addition, broader threats of market failure stemming from adverse selection and  
506 moral hazard may also apply. Consequently, many of the discussed benefits and risks

507 of crowdfunding health campaigns are shared more broadly with those of crowdfunding  
508 projects in other sectors. Equity-based projects seem particularly prone to market  
509 failures due to the financial sensitivity of their investors and the greater size of the  
510 potential market compared to those of reward- or donation-based campaigns.

511 Therefore, the outlined economic risks in this paper may apply more significantly to  
512 equity-based projects in health care.

513  
514 Where crowdfunding in health appears to diverge from generalized crowdfunding theory  
515 is the negative externality inefficient priority setting may have towards achieving broader  
516 public health goals. Where most of the highlighted benefits and risks focus on  
517 crowdfunding participants, the issue of inefficient priority setting could affect the health  
518 of people beyond the crowdfunding market. Scientific research, social initiatives, and  
519 innovation in health care have a uniquely direct impact on individuals suffering from  
520 medical conditions. Therefore, this new market for health cannot just be economically  
521 stable; it must also be designed to optimally and equitably improve public health.

522  
523 Policy makers in countries with insurance gaps and inadequate universal health care  
524 coverage must realize that health-related crowdfunding is often a symptom of gaps in  
525 health policy. Individuals crowdfund their medical expenses because health insurance  
526 coverage in their country is incomplete (Snyder, 2016); scientists turn to crowdfunding  
527 as public grant funding declines and pharmaceutical companies de-risk their R&D  
528 portfolios (Dragojlovic & Lynd, 2014); start-up entrepreneurs solicit the 'crowd' because  
529 they are unable to access capital through conventional avenues (Wirsching et al.,

530 2015). It seems impractical to patch all these gaps in access to financing using  
531 crowdfunding. It is our opinion that crowdfunding is a complimentary financing tool in  
532 health care that can offer interim financial relief while improved policies are designed  
533 and implemented. Particularly troublesome is the inordinate number of crowdfunding  
534 projects for covering medical expenses, highlighting the need for improved health  
535 insurance coverage around the world. While altruistic crowdfunding partially fills this  
536 medical insurance gap, it should not be thought of as a practical method for mitigating  
537 user charges and attaining universal health coverage in any country, particularly  
538 developing countries.

539  
540 Crowdfunding could play a more valuable role in health science research, non-profit  
541 health initiatives, and commercial innovation. Crowdfunding offers the possibility of  
542 much needed access to funding for scientists that can make important contributions to  
543 often-neglected medical research. Valuable non-profit health programs are additionally  
544 benefiting from new financing driven by crowdfunding. We believe this opportunity to  
545 expand funding for non-profit health ventures should be better guided by sound  
546 evidence and health priority setting, which are often lacking in the current system.  
547 Crowdfunding for-profit health ventures also seems promising and allows SMEs to more  
548 effectively compete in the health sector. At present, the scalability of health care  
549 crowdfunding appears generally capped at projects under €1 million (Moran, 2017).  
550 However, crowdfunding may allow health researchers and SMEs to validate the  
551 worthiness or profitability of their venture to larger companies and major private  
552 investors thereby opening access to additional financing. Regulators look to be moving

553 in the right direction by trying to improve the market's stability, but it appears there is a  
554 need for greater legal and regulatory harmonization across borders. Additionally, the  
555 risk of illegal activity could threaten needed confidence in the fledgling crowdfunding  
556 market and, thus policy makers must approach this issue seriously.

557  
558 Many of the economic risks stem, at least in part, from the principal-agent relationship  
559 and the associated information asymmetry. Thus, there could be an important role for  
560 targeted regulation that minimizes steep information asymmetry gradients between  
561 initiators and funders. For instance, it may be valuable to have a credentialing body  
562 endorsed by relevant scientific associations that could certify a crowdfunding project's  
563 credibility and rate the project's health care value. In parallel, a financial regulatory  
564 agency specific to crowdfunding could assess project financial riskiness, impose  
565 solvency requirements on funders and initiators, monitor illegal activity, regulate  
566 transaction charges levied by platforms, and ensure platform transparency. In this way,  
567 public health objectives could be fostered and the market's economic stability could be  
568 strengthened.

569  
570 There are a couple limitations to this review. First, the simple sampling strategy used to  
571 solicit interviews does not capture the full range of stakeholders in the crowdfunding  
572 market. This sampling technique was only used to validate and compliment the main  
573 results from our rapid evidence review. It is our hope that a comprehensive primary  
574 research project employing a rigorous interviewing protocol will build on this introductory  
575 review. Second, this review solely focuses on the economic issues of crowdfunding

576 health care; there are a variety of important ethical and social issues, discussed in other  
577 articles, that we do not broach such as equity, access, autonomy, and privacy (Berliner  
578 & Kenworthy, 2017; Shaw et al., 2016; Snyder, 2016; Snyder, Mathers, & Crooks,  
579 2016). Understanding the role of these other aspects in conjunction with the economic  
580 issues we raise is critical to understanding the complete set of benefits and risks of  
581 crowdfunding health care, especially crowdfunding medical expenses.

582

## 583 **CONCLUSION**

584

585 This review demonstrates that crowdfunding plays a unique and growing role in the  
586 global health sector. There appears to be four major types of crowdfunded health  
587 projects that present important economic benefits and risks. The limited scope of  
588 literature on this topic indicates that the importance of health-related crowdfunding may  
589 be underappreciated. Consequently, as crowdfunding seizes a larger role in health care,  
590 there will be a need for greater academic scrutiny and scholarship in this field. Research  
591 in health-related crowdfunding can support evidence-based policy frameworks that  
592 enhance the health sector and allow it to evolve with crowdfunding. A valuable first step  
593 would be a comprehensive mapping and quantification of health-related crowdfunding  
594 campaigns with the goal of identifying measures to mitigate the economic risks  
595 identified in this review.

596

## 597 **REFERENCES**

598

- 599 112th US Congress. Jumpstart our Business Startups Act. Title III - Crowdfunding  
600 (2012). 2nd Session.
- 601 Adams, L., & Constantine, D. (2015). Crowdfunding and IP in Health and Biotech Start-  
602 ups (Part 3): Potential Dangers.  
603 [https://www.globalipmatters.com/2015/06/29/crowdfunding-and-ip-in-health-and-](https://www.globalipmatters.com/2015/06/29/crowdfunding-and-ip-in-health-and-biotech-start-ups-part-3-potential-dangers)  
604 [biotech-start-ups-part-3-potential-dangers](https://www.globalipmatters.com/2015/06/29/crowdfunding-and-ip-in-health-and-biotech-start-ups-part-3-potential-dangers) (Accessed 23.05.2017)
- 605 Agrawal, A., Catalini, C., & Goldfarb, A. (2014). Some Simple Economics of  
606 Crowdfunding. *Innovation Policy and the Economy*, 14(1), 63–97.
- 607 Agrawal, A., Catalini, C., & Goldfarb, A. (2015). Crowdfunding: Geography, Social  
608 Networks, and the Timing of Investment Decisions. *Journal of Economics and*  
609 *Management Strategy*, 24(2), 253–274.
- 610 Baeck, P., Collins, L., & Zhang, B. (2014). *Understanding alternative finance: The UK*  
611 *alternative finance industry report 2014*. Nesta.  
612 [https://www.nesta.org.uk/sites/default/files/understanding-alternative-finance-](https://www.nesta.org.uk/sites/default/files/understanding-alternative-finance-2014.pdf)  
613 [2014.pdf](https://www.nesta.org.uk/sites/default/files/understanding-alternative-finance-2014.pdf) (Accessed 23.05.2017)
- 614 Barclay, E. (2012). The sick turn to crowdfunding to pay medical bills. *National Public*  
615 *Radio*. [http://www.npr.org/sections/health-shots/2012/10/23/163489063/the-sick-](http://www.npr.org/sections/health-shots/2012/10/23/163489063/the-sick-turn-to-crowdfunding-to-pay-medical-bills)  
616 [turn-to-crowdfunding-to-pay-medical-bills](http://www.npr.org/sections/health-shots/2012/10/23/163489063/the-sick-turn-to-crowdfunding-to-pay-medical-bills) (Accessed 23.05.2017)
- 617 Belleflamme, P., & Lambert, T. (2014). Crowdfunding: some empirical findings and  
618 microeconomic underpinnings. *Revue Bancaire Et Financiere*, 4, 288–296.
- 619 Belleflamme, P., Lambert, T., & Schwienbacher, A. (2013). Individual crowdfunding  
620 practices. *Venture Capital*, 15(4), 313–333.
- 621 Belleflamme, P., Omrani, N., & Peitz, M. (2015). The economics of crowdfunding

- 622 platforms. *Information Economics and Policy*, 33, 11–28.
- 623 Berliner, L. S., & Kenworthy, N. J. (2017). Producing a worthy illness: Personal  
624 crowdfunding amidst financial crisis. *Social Science & Medicine*, In Press.
- 625 Boudreau, K. J., Jeppesen, L. B., Reichstein, T., & Rullani, F. (2015). Crowdfunding as  
626 “donations”: theory & evidence. *Harvard Business School Working Paper 16-038*.
- 627 Burch, G., & Chan, J. (2015). Does Medical Crowdfunding Reduce Bankruptcy Rates in  
628 the United States? An Empirical Analysis. *Information Systems Research*.  
629 <https://ssrn.com/abstract=2676821>
- 630 Burch, G., Ghose, A., & Wattal, S. (2013). An empirical examination of the antecedents  
631 and consequences of contribution patterns in crowd-funded markets. *Information  
632 Systems Research*, 24(3), 499–519.
- 633 Byrnes, J. E. K., Ranganathan, J., Barbara L. E., Faulkes, Z. (2014). To Crowdfund  
634 Research, Scientists Must Build an Audience for Their Work. *PLOS One*. 9(12): e  
635 110329.
- 636 Cameron, M., Flach, E., MacDonald-Korth, D., Manaktala, N., & Walker, T. (2015).  
637 *Democratising finance: Alternative finance demystified* (pp. 1–81). DealIndex.
- 638 Cameron, P. P. (2013). Crowdfunding genomics and bioinformatics. *Genome Biology*,  
639 14(9), 134–134.
- 640 Chakradhar, S. (2015). In new crowdfunding trend, donors decide fate of clinical trials.  
641 *Nature Publishing Group*, 21(2), 101–102.
- 642 Chen, D., & Lin, Z. (2014). Rational or irrational herding in online microloan markets:  
643 evidence from China. *SSRN*. <https://ssrn.com/abstract=2425047>
- 644 Cunha, D. (2015). Americans Are Crowdfunding Health Care. They Shouldn't Have to.



- 645 <http://time.com/3831505/crowdfunding-health-care/>
- 646 Cusmano, L. (2015). Case study on crowdfunding. *OECD*.
- 647 [http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=CFE/SME\(2](http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=CFE/SME(2)
- 648 013)7/ANN1/FINAL&docLanguage=En (Accessed 23.05.2017)
- 649 Debelius, J. W., Vazquez-Baeza, Y., McDonald, D., Xu, Z., Wolfe, E., & Knight, R.
- 650 (2016). Turning Participatory Microbiome Research into Usable Data: Lessons from
- 651 the American Gut Project. *Journal of Microbiology & Biology Education*, 17(1), 46–
- 652 50.
- 653 Del Savio, L. (2017). The Place of Crowdfunding in the Discovery of Scientific and
- 654 Social Value of Medical Research. *Bioethics*.
- 655 Dragojlovic, N., & Lynd, L. D. (2014). Crowdfunding drug development: the state of play
- 656 in oncology and rare diseases. *Drug Discovery Today*, 19(11), 1775–1780.
- 657 European Commission. (2014). *Communication from the Commission to the European*
- 658 *Parliament, the Council, the European Economic and Social Committee and the*
- 659 *Committee of the Regions: Unleashing the potential of crowdfunding in the*
- 660 *European Union* (Vol. 2014, pp. 1–12). Brussels.
- 661 European Crowdfunding Network. (2014). *Review of crowdfunding regulation:*
- 662 *Interpretations of existing regulation concerning crowdfunding in Europe, North*
- 663 *America and Israel* (pp. 1–284).
- 664 Fiminska, Z. (2015). People power: Can crowdfunding provide money for drug
- 665 discovery? [http://social.eyeforpharma.com/research-development/people-power-](http://social.eyeforpharma.com/research-development/people-power-can-crowdfunding-provide-money-drug-discovery)
- 666 [can-crowdfunding-provide-money-drug-discovery](http://social.eyeforpharma.com/research-development/people-power-can-crowdfunding-provide-money-drug-discovery) (Accessed 23.05.2017)
- 667 Freedman, S., & Jin, G. Z. (2008). Do Social Networks Solve Information Problems for

- 668 Peer-to-Peer Lending? Evidence from Prosper.com. *Information Systems Research*.  
669 <https://ssrn.com/abstract=1936057> (Accessed 23.05.2017)
- 670 Gabison, G. A. (2015). *Understanding Crowdfunding and its Regulations* (pp. 1–40).  
671 European Commission, Joint Research Centre, Institute for Prospective  
672 Technological Studies.
- 673 Gerber, E. M., & Hui, J. (2013). Crowdfunding: Motivations and deterrents for  
674 participation. *ACM Transactions on Computer-Human Interaction*, 20(6).
- 675 Hawkes, D., & Thomson, M. (2015). Clinical trials: Crowdfunded trials doubly  
676 scrutinized., 528(7582), 333–333.
- 677 Hemmadi, M. (2015). Equity crowdfunding will soon be legal in Canada. Should you  
678 jump in? [http://www.canadianbusiness.com/investing/equity-crowdfunding-for-](http://www.canadianbusiness.com/investing/equity-crowdfunding-for-canadians/)  
679 [canadians/](http://www.canadianbusiness.com/investing/equity-crowdfunding-for-canadians/) (Accessed 23.05.2017)
- 680 Himmelstein, D. U., Thorne, D., Warren, E., & Woolhandler, S. (2009). Medical  
681 bankruptcy in the United States, 2007: results of a national study. *The American*  
682 *Journal of Medicine*, 122(8), 741–746.
- 683 infoDev. (2013). *Crowdfunding's Potential for the Developing World* (pp. 1–103).  
684 Washington, DC: World Bank. [http://www.infodev-](http://www.infodev.org/infodev-files/wb_crowdfundingreport-v12.pdf)  
685 [files/wb\\_crowdfundingreport-v12.pdf](http://www.infodev.org/infodev-files/wb_crowdfundingreport-v12.pdf) (Accessed 23.05.2017)
- 686 Investors navigate the risks of crowdfunding. (2015). Investors navigate the risks of  
687 crowdfunding.
- 688 Kaplan, K. K. (2013). Crowd-funding: Cash on demand. *Nature (London)*, 497(7447),  
689 147–147.
- 690 Kirby, E., & Worner, S. (2014). *Crowd-funding: An Infant Industry Growing Fast* (pp. 1–

- 691 63). Madrid, Spain: International Organization of Securities Commissions.  
692 <https://www.iosco.org/library/pubdocs/pdf/IOSCOPD459.pdf> (Accessed 23.05.2017)
- 693 Kuti, M. (2014). Crowdfunding. *Public Finance Quarterly*, 59(3), 355–366.
- 694 Lee, E., & Lee, B. (2012). Herding behavior in online P2P lending: An empirical  
695 investigation. *Poverty, Technology and Microfinance*, 11(5), 495–503.
- 696 Lehner, O. M., & Nicholls, A. (2014). Social finance and crowdfunding for social  
697 enterprises: a public-private case study providing legitimacy and leverage. *Venture*  
698 *Capital*, 16(3), 271–286.
- 699 Ley, A., & Weaven, S. (2011). Exploring agency dynamics of crowd funding in start-up  
700 capital financing. *Academy of Entrepreneurship Journal*, 17(1), 85–110.
- 701 Marshall, M. N. (1996). Sampling for qualitative research. *Family Practice*, 13(6), 522–  
702 526.
- 703 Mind the gap: charity and crowdfunding in health care. (2017). *Lancet Oncology*,  
704 18(3):269.
- 705 Mollick, E. (2014). The dynamics of crowdfunding: An exploratory study. *Journal of*  
706 *Business Venturing*, 29(1), 1–16.
- 707 Moran, N. (2017). Biotech startups woo increasing numbers of crowdfunders. *Nature*  
708 *Biotechnology*, 35(4), 299–300.
- 709 Orelli, B. (2012). Biotech crowdfunding paves way for angels. *Nature Biotechnology*,  
710 30(11), 1020.
- 711 Ortero, P. (2015). Crowdfunding. A new option for funding health projects. *Archivos*  
712 *Argentinos De Pediatría*, 113(2), 154–157.
- 713 Ozdemir, V, J, F., & S, S. (2015). Crowdfunding 2.0: The next-generation philanthropy:

- 714 A new approach for philanthropists and citizens to co-fund disruptive innovation in  
715 global health, *16*(3), 267–271.
- 716 Pazowski, P., & Czudec, W. (2014). *Economic prospects and conditions of*  
717 *crowdfunding* (pp. 1–10). Pororoz, Slovenia. [http://www.toknowpress.net/ISBN/978-](http://www.toknowpress.net/ISBN/978-961-6914-09-3/papers/ML14-685.pdf)  
718 [961-6914-09-3/papers/ML14-685.pdf](http://www.toknowpress.net/ISBN/978-961-6914-09-3/papers/ML14-685.pdf) (Accessed 23.05.2017)
- 719 Perlstein, E. O. (2013). Anatomy of the Crowd4Discovery crowdfunding campaign.  
720 *SpringerPlus*, *2*(560), 1–3.
- 721 Philippidis, A. (2013). Crowdfunding touches down in biotech. *Genetic Engineering and*  
722 *Biotechnology News*, *33*(10), 6–8.
- 723 PricewaterhouseCoopers. (2012). Considering an IPO? The costs of going and being  
724 public may surprise you.  
725 [https://www.strategyand.pwc.com/media/file/Strategyand\\_Considering-an-IPO.pdf](https://www.strategyand.pwc.com/media/file/Strategyand_Considering-an-IPO.pdf)  
726 (Accessed 23.05.2017)
- 727 Robock, Z. (2014). The risk of money laundering rough crowdfunding: A funding portal's  
728 guide to compliance and crime fighting. *Michigan Business Entrepreneurial Law*  
729 *Review*, *4*(1), 1–19.
- 730 Schweinbacher, A., & Larralde, B. (2012). Crowdfunding of small entrepreneurial  
731 ventures. In D. Cumming (Ed.), *The Oxford Handbook of Entrepreneurial Finance*.
- 732 Share the World's Resources. (2014). *A primer on global economic sharing*.  
733 <http://www.sharing.org/information-centre/reports/primer-global-economic-sharing>  
734 (Accessed 23.05.2017)
- 735 Sharma, A., Khan, J. S., & Devereaux, P. J. (2015). Is crowdfunding a viable source of  
736 clinical trial research funding? *Lancet*, *386*(9991), 338.

- 737 Shaw, D., de Wert, G., Dondorp, W., Townend, D., Bos, G., & van Gelder, M. (2016).  
738 Permitting patients to pay for participation in clinical trials: the advent of the P4 trial.  
739 *Medicine, Health Care, and Philosophy*, In Press.
- 740 Sisler, J. (2012). Crowdfunding for medical expenses. *Canadian Medical Association*  
741 *Journal*, 184(2), E123–E124.
- 742 Smith, A. (2016). *Shared, collaborative and on demand: the new digital economy*. Pew  
743 Research Centre. <http://www.pewinternet.org/2016/05/19/the-new-digital-economy/>  
744 (Accessed 23.05.2017)
- 745 Snyder, J. (2016). Crowdfunding FOR MEDICAL CARE: Ethical Issues in an Emerging  
746 Health Care Funding Practice. *The Hastings Center Report*, 46(6), 36–42.
- 747 Snyder, J., Mathers, A., & Crooks, V. A. (2016). Fund my treatment!: A call for ethics-  
748 focused social science research into the use of crowdfunding for medical care.  
749 *Social Science & Medicine*, 169, 27–30.
- 750 Strausz, R. (2016). A Theory of Crowdfunding - A Mechanism Design Approach with  
751 Demand Uncertainty and Moral Hazard. <http://ssrn.com/abstract=2766550>  
752 (Accessed 23.05.2017)
- 753 Vachelard, J., Gambarra-Soares, T., Augustini, G., Riul, P., & Maracaja-Coutinho, V.  
754 (2016). A Guide to Scientific Crowdfunding. *PLoS Biology*, 14(2), e1002373.
- 755 Valančienė, L., & Jegelevičiūtė, S. (2013). Valuation of crowdfunding: Benefits and  
756 drawbacks. *Economics and Management*, 18(1), 1–10.
- 757 Wenner, D. M., Kimmelman, J., & London, A. J. (2015). Patient-Funded Trials:  
758 Opportunity or Liability? *Stem Cell*, 17(2), 135–137.
- 759 Wheat, R. E., Wang, Y., Byrnes, J. E., & Ranganathan, J. (2013). Raising money for

- 760 scientific research through crowdfunding. *Trends in Ecology & Evolution*, 28(2), 71–  
761 72.
- 762 Wirsching, S., Laqua, M., & Colthorpe, J. (2015). *Analysis of Crowd- based Financing in*  
763 *European Life Sciences*. BIOCOM AG (pp. 1–60). [https://biocom.de/en/consulting-](https://biocom.de/en/consulting-and-studies/analyses-and-research/analysis-of-crowd-based-financing-in-the-european-life-sciences/)  
764 [and-studies/analyses-and-research/analysis-of-crowd-based-financing-in-the-](https://biocom.de/en/consulting-and-studies/analyses-and-research/analysis-of-crowd-based-financing-in-the-european-life-sciences/)  
765 [european-life-sciences/](https://biocom.de/en/consulting-and-studies/analyses-and-research/analysis-of-crowd-based-financing-in-the-european-life-sciences/) (Accessed 23.05.2017)
- 766 Young, M. J., & Scheinberg, E. (2017). The Rise of Crowdfunding for Medical Care:  
767 Promises and Perils. *Jama*, 317(16), 1623–1624.
- 768 Zhang, J., & Liu, P. (2012). Rational Herding in Microloan Markets. *Management*  
769 *Science*, 58(5), 892–912.
- 770

**ACKNOWLEDGEMENTS**

We would like to thank the following for taking the time to be interviewed: Richard Swart (Institute for Money, Technology, & Financial Inclusion, University of California, Irvine); Lucia Cusmano and Kris Boschmans (Centre for Entrepreneurship, SMEs, and Local Development, OECD); Oliver Gajda (European Crowdfunding Network); and Jason Pope (UK Financial Conduct Authority). The discussion and conclusions made in this paper are wholly the authors' and do not necessarily reflect those individuals that were interviewed.

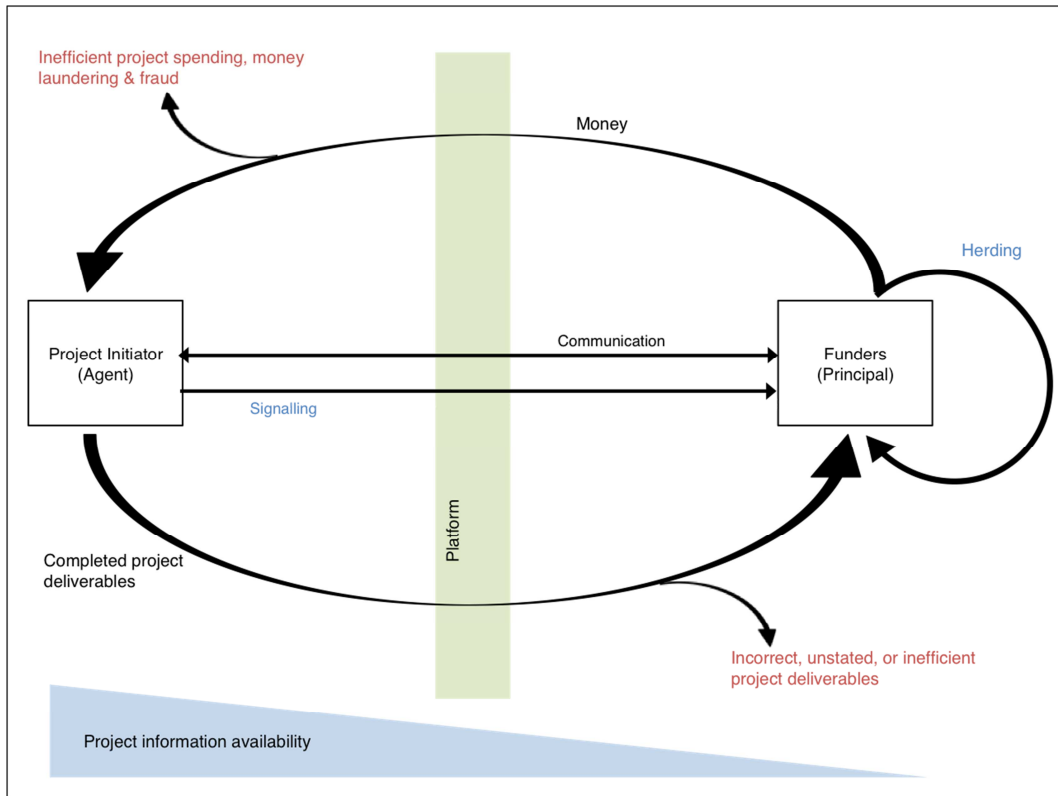
Project type	Definition	Financing method	Project examples	Platform examples
<b>Health expenses</b>	Crowdfunded health projects that finance an individual's out-of-pocket expenses for medical services and products	Donation-based	Surgery, chemotherapy, rehabilitative care, and mobility & accessibility adaptations	GoFundMe; Indiegogo; Watsi; Crowdfund Health; YouCaring; GiveForward
<b>Health initiatives</b>	Crowdfunded not-for-profit health initiatives that provide benefit to the wider public or a specific group of people.	Donation-based; Reward-based	Charitable fundraising, patient education programs, and disease awareness campaigns	KickStarter; Indiegogo, MedStartr
<b>Health research</b>	Crowdfunded not-for-profit health research that typically focuses on treatments for rare or neglected diseases.	Donation-based	Basic health science research, genomic studies, and preclinical & early clinical studies	MyProjects; Consano; Cure Cancer Starter; Experiment; RocketHub; StartACure; WhenYouWish; Cancer Research UK; Give To Cure
<b>Commercial health innovation</b>	Crowdfunded for-profit health ventures that need additional capital to get off the ground.	Investment-based	Drug development, therapy innovations, and complimentary & alternative medical treatments	Crowdcube; ShareIn; MedStartr; Healthios Xchange; Wiseed; Venture Health; Homestrings

**Table 1.** A typology of crowdfunded health projects



Project type	Benefits	Risks
<b>Health expenses (Donation-based)</b>	<ul style="list-style-type: none"> <li>Expands the pool of potential donors</li> <li>Draws money and attention to neglected and under-supported medical conditions</li> <li>Partially fills gap in medical care coverage for patients in need</li> <li>Backers can provide support community for the patient</li> </ul>	<ul style="list-style-type: none"> <li>Asymmetrical information and poor project transparency makes it difficult for backers to ensure project accountability</li> <li>Risk of fraud and money laundering</li> <li>High transaction fees charged by platform may make crowdfunding an inefficient method of financing</li> </ul>
<b>Health initiatives (Donation-based; Reward-based)</b>	<ul style="list-style-type: none"> <li>Expands the pool of potential donors</li> <li>Draws money and attention to neglected and under-supported health care issues</li> <li>Partially fills gap in access to financing for SMEs and individuals</li> <li>Backers can hold project initiators accountable &amp; be engaged in initiative progress</li> </ul>	<ul style="list-style-type: none"> <li>Asymmetrical information and poor project transparency can make it difficult for backers to ensure project accountability</li> <li>Risk of fraud and money laundering</li> <li>High transaction fees charged by platform may make crowdfunding an inefficient method of financing</li> </ul>
<b>Health research (Donation-based)</b>	<ul style="list-style-type: none"> <li>Expands the pool of potential donors</li> <li>Draws money and attention to neglected and under-supported health research</li> <li>Partially fills gap in public and private funding of health research</li> <li>Backers can hold researchers accountable and be engaged in research progress</li> </ul>	<ul style="list-style-type: none"> <li>Community unlikely able to efficiently select high-priority projects from a public health perspective</li> <li>Research projects may not be funded based on scientific merit</li> <li>Ethical dilemma created when patients can fund and participate in research pertinent to their own treatment</li> <li>Backer short-term goals can supersede more important long-term research goals</li> <li>Asymmetrical information and poor project transparency can make it difficult for backers to ensure project accountability</li> <li>Risk of fraud and money laundering</li> <li>High transaction fees charged by platform may make crowdfunding an inefficient method of financing</li> </ul>
<b>Commercial health innovation (Investment-based)</b>	<ul style="list-style-type: none"> <li>Allows non-accredited investors to access the private equity market</li> <li>Draws money and attention to neglected and under-supported health innovation</li> <li>Partially fills gap in access to financing for SMEs</li> <li>Backers can hold SMEs accountable and be engaged in development progress</li> <li>Backers can offer additional expertise, resources, and support for SMEs</li> </ul>	<ul style="list-style-type: none"> <li>Backers may not have expertise to efficiently select profitable projects</li> <li>Community unlikely able to efficiently select high-priority projects from a public health perspective</li> <li>High risk of project failure and backers losing their financial investment</li> <li>Asymmetrical information and poor project transparency can make it difficult for backers to ensure project accountability</li> <li>Laws and regulation of equity-based crowdfunding is limited in many countries</li> <li>Concerns of intellectual property rights protection limit the applicability of crowdfunding innovative ideas</li> <li>Risk of fraud and money laundering</li> <li>High transaction fees charged by platforms may make crowdfunding a relatively inefficient method of financing compared to traditional financing avenues</li> </ul>

**Table 2.** Key economic benefits and concerns across the types of crowdfunded health projects



**Figure 1.** Information asymmetry in crowdfunding

**RESEARCH HIGHLIGHTS**

- There has been a rapid uptake of crowdfunding in the global health sector
- Crowdfunding finances health expenses, initiatives, research, and innovation
- There are several possible economic benefits and risks of crowdfunding the health market
- Regulations should facilitate stability and efficiency in the crowdfunding market
- The market for crowdfunding health should be designed to improve public health