

ARTICLES

Conducting Respondent-Driven Sampling with Ethnic Minority Populations: The State of the Field

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Ethnic minorities are often underrepresented in survey research, due to the challenges many researchers face in including these populations. Respondent-driven sampling (RDS) was developed in the late 1990s in order to investigate populations otherwise “hidden” from researchers due to a lack of extant sampling frames. RDS relies on individuals who recruit their fellow population members, allowing samples to grow through network linkages. RDS holds promise for recruiting ethnic minority respondents, and its use has steadily increased since the early 2000s. However, practicable guidance for implementing RDS with these populations is scarce. To address this methodological gap, I present the results of a scoping review of RDS studies targeting ethnic minority populations. I find that it is possible to conduct successful RDS studies with a range of ethnic minority populations. However, researchers intending to work with these populations must consider the intersectional nature of these populations’ “hiddenness”, including economic, educational, linguistic, legal, political, and social vulnerabilities, through all stages of the study design process.

Introduction

As countries and regions become increasingly multicultural, multiethnic, and multilingual (Jensen et al. 2021; United Nations 2020), the need for high-quality data on demographic subgroups has also grown (Willis et al. 2014). Such data is necessary to understand changes in population diversity, socio-economic shifts, and human rights monitoring (European Commission 2021; Willis et al. 2014). However, individuals with a migration background or who are members of ethnic minority groups are frequently underrepresented in survey research, due to a lack of extant sampling frames and statistical constructs which privilege more homogenous general population members in survey language, geographic accessibility, and availability (Nam et al. 2013; Yancey, Ortega, and Kumanyika 2006). A further challenge is that many ethnic minority groups are what Kalton and Anderson (1986) consider “rare”, i.e., they comprise less than 10 percent of the total population, even though – in aggregate – members of these demographic subgroups may comprise a sizeable percentage of the population (Destatis 2022).

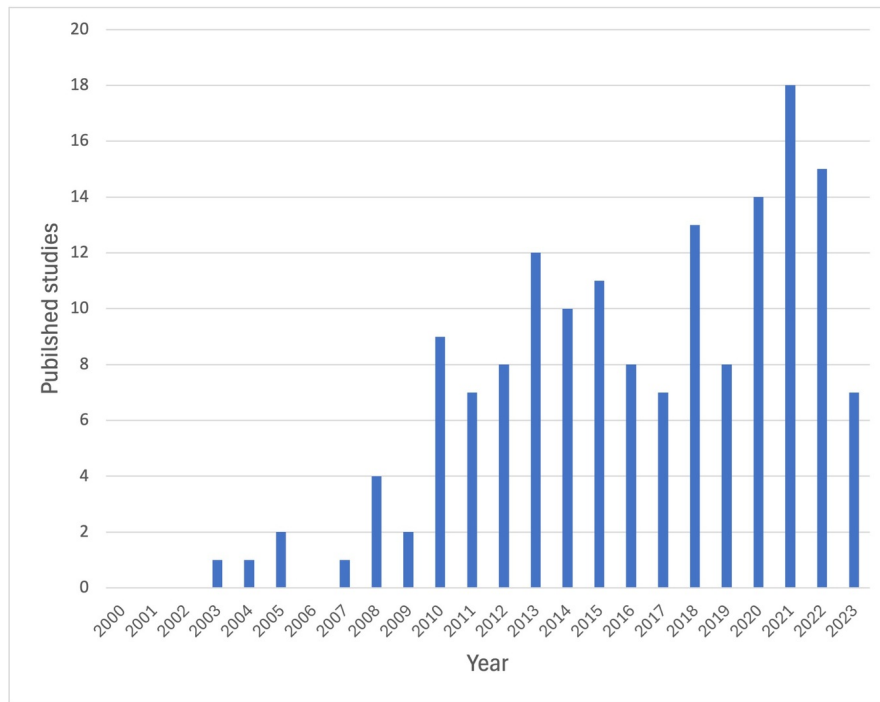


Figure 1. “RDS + ethnic minority” related studies by year of publication

One increasingly popular method of sampling and recruiting ethnic minority individuals to research studies is respondent driven sampling (RDS; see [Figure 1](#)). RDS was developed in the late 1990s in order to investigate populations otherwise “hidden” from researchers due to lack of sampling frames (Heckathorn 1997). In an RDS sample, non-random “seeds”, i.e., members of the target population, are selected and asked to recruit further respondents from their personal networks, with an incentive provided to both seeds and recruits. Each seed and subsequent recruit is provided “coupons,” which serve as proof that the individual was recruited into the study through a personal network and to indicate the network chain to which they belong ([Figure 2](#)). Researchers can thus apply mathematical weights to partially compensate for the initial non-randomness of the seeds (Hipp, Kohler, and Leumann 2019).

RDS provides several advantages for including potentially vulnerable ethnic minority populations: recruited individuals have a higher likelihood of membership in the target population than respondents recruited via probability sampling (Lavallée 2014), and potential respondents are unknown to the researchers until such time as they choose to act on a referral. This reduces risk to both the respondents and the researchers, as the interview can take place in more neutral – and perhaps safer – locations such as public libraries, or even office spaces rented for the study purpose (Constantine 2010; Montealegre et al. 2013). Furthermore, advances in RDS methods allow for unbiased (point) estimates (Hipp, Kohler, and Leumann 2019; Lavallée 2014; Salganik and Heckathorn 2004).

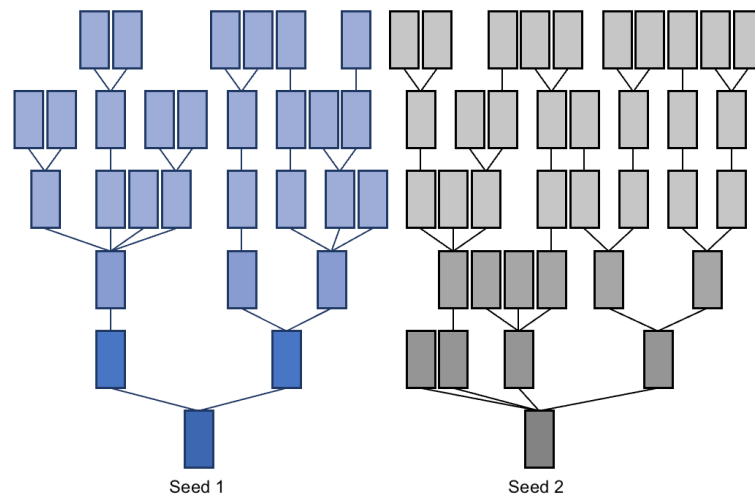


Figure 2. Structure of hypothetical RDS recruitment chains

However, in practice, RDS can be difficult to implement due to its “highly prescriptive” recruitment requirements (Waters 2014, page 3, see also Middleton et al. 2022): seeds and recruits must know each other; recruitment chains and relationships must be documented using coupons; the number of coupons provided per recruiter is limited; and all participants must report their personal network size. Additionally, extant literature often provides inadequate methodological details to support researchers in implementing new studies or troubleshooting complications (Avery and Rotondi 2020; Johnston et al. 2019; White et al. 2015). In the case of RDS with ethnic minorities, these challenges are further compounded by the limited research focused specifically on ethnic minorities.

This review intends to address this methodological gap by making explicit challenges resulting from these populations’ frequent economic, educational, linguistic, legal, political, and social vulnerabilities and identifying methodological adaptations necessary to successfully implement RDS with ethnic minority populations.

The Present Study

Between May and August 2023, I identified a total of 67 unique peer-reviewed journal articles through a combination of Web of Science and Google Scholar searches, previous literature reviews and outreach to colleagues (see [Figure 3](#)). Non-article results (e.g., book chapters, conference presentations), as well as articles not written in English, were excluded. Articles were included if they described original research (i.e., not reviews) which exclusively targeted ethnic or racial minority individuals for RDS

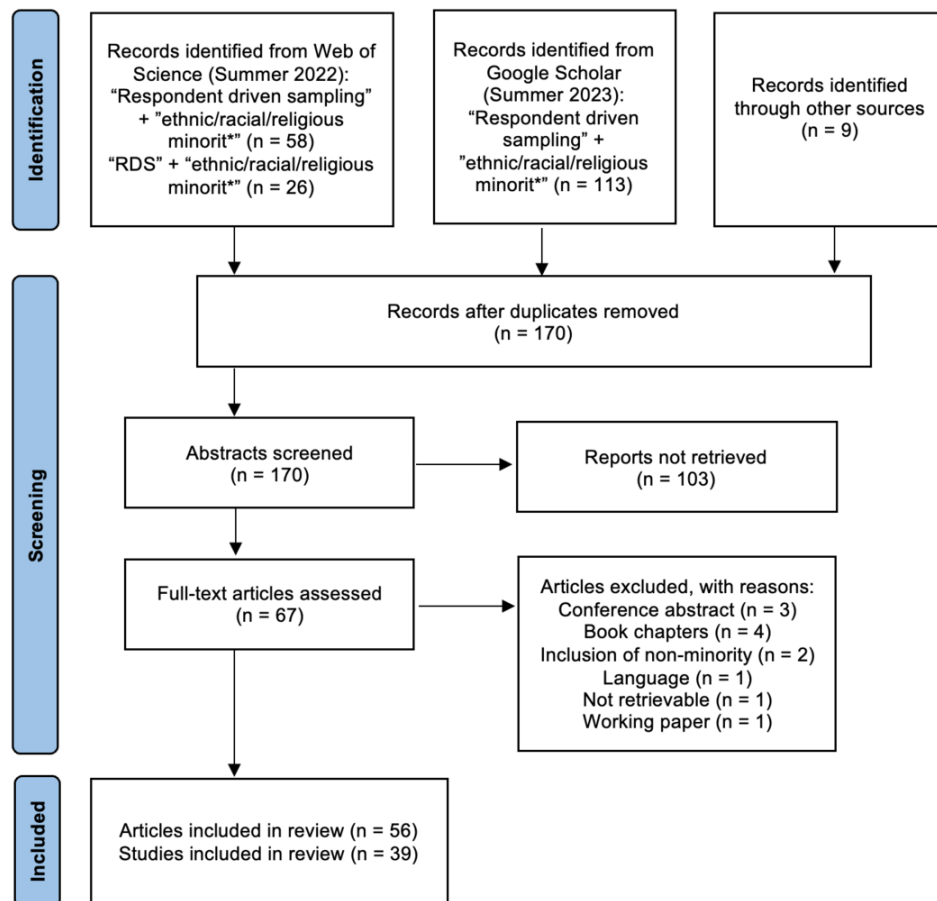


Figure 3. Scoping results per PRISMA guidelines

recruitment to a study ($n = 56$). Multiple articles dealt with the same study. Despite overlap, I retained all eligible articles for review, covering 39 studies. [Table 1](#) presents the included studies.

The earliest identified study was conducted in 2003 (Ramirez-Valles et al. 2005) with the most recent conducted in 2019 (Rivera, Carrillo, and Braunstein 2021; Rivera, Lopez, and Braunstein 2023; Sadlon 2022; Wirtz et al. 2021). The majority of studies (26) were published in public health-related journals, followed by methods-focused journals (5).

Studies ranged in duration from one (MacQueen et al. 2015) to 39 months (Franks et al. 2018) with an average of seven months. Six studies recruited fewer than 100 individuals, although three of these (Coombs et al. 2014; Henny et al. 2019; Vershinina and Rodionova 2011) were qualitative or pilot studies. Eighteen studies recruited more than 500 individuals, including three studies (four articles) which recruited more than 1000 individuals (Mizuno et al. 2012; Murrill et al. 2016; Wangroongsarb et al. 2011; Westgard et al. 2021). As shown in [Figure 4](#), there appears to be no correlation between duration and sample size.

Table 1. Characteristics of included articles

Study Number	Article Authors	Year	Duration (months)	Target Population	Field	Locality	# of Seeds	Total Sample	Ratio	RDS Type	Incentive	CBPR	Formative research
1	Ramirez-Valles et al. 2005	2003	6	Latino GB & TGW	Public health	Chicago, San Francisco US	16	200	8.0%	F2F	50USD + 20/recruit	Not stated	Yes
2	Bruce, Ramirez-Valles, and Campbell 2008 Kuhns, Vázquez, and Ramirez-Valles 2008 Ramirez-Valles et al. 2008 Ramirez-Valles et al. 2010	2004	5	Latino GB & TGW	Public health	Chicago, San Francisco US	38	643	5.9%	F2F	50USD + 20/recruit	Not stated	Yes
3	Mizuno et al. 2012 Murrill et al. 2016	2005-2006	10	Black & Latino MSM	Public health	NYC, Philadelphia, LA, US	98	2235	4.4%	F2F	50USD + 15-20/recruit	Not stated	Not stated
4	Tyldum 2021	2006	2	Polish immigrants	Methods	Oslo, NO	Not stated	510	NA	F2F	150NOK + 100/recruit	Not stated	Not stated
5	Kogan et al. 2011	2007	11	Black young adults	Development studies	Georgia, US	24	295	8.1%	F2F	50USD + 20/recruit	Not stated	Not stated
6	Evans et al. 2011	2008	7	CEE migrant MSM	Public health	London, UK	17	20	85.0%	F2F	10GBP + 5/recruit	Not stated	No
7	Gilbert and Rhodes 2013 Gilbert and Rhodes 2014 Gilbert et al. 2014 Rhodes and McCoy 2015 Rhodes et al. 2013	2009	9	Latino MSM immigrants	Public health	North Carolina, US	17	190	8.9%	F2F	50USD + 20/recruit	Yes	Yes
8	Song et al. 2012	2009	8	Latino immigrants	Public health	North Carolina, US	8	164	4.9%	F2F	50USD + 20/recruit	Not stated	Yes
9	Wangroongsarb et al. 2011	2009	13	Cambodian & Burmese migrants	Public health	Thailand	30	1719	1.7%	F2F	Not stated	Not stated	Not stated
10	Platt, Luthra, and Frere-Smith 2015	2009-2010	12	Polish immigrants	Demography	London, UK	711	778	91.4%	F2F	10GBP + 10/recruit	Not stated	Yes
11	Platt, Luthra, and Frere-Smith 2015	2009-2010	12	Pakistani immigrants	Demography	London, UK	358	751	47.7%	F2F	10GBP + 10/recruit	Not stated	Yes
12	Denson et al. 2017	2010	3	Black & Latina TGW	Public health	Chicago, Houston, LA, US	37	241	15.4%	F2F	20-25USD + 10/recruit	Not stated	Not stated
13	Djonc et al. 2013	2010	2	Young adult Roma	Public health	Belgrade, Kragujevac, RS	12	411	2.9%	F2F	10EUR + 5/recruit	Not stated	Yes
14	Montealegre et al. 2012 Montealegre et al. 2013	2010	4	Central American immigrant women	Public health	Houston, US	3	226	1.3%	F2F	20USD + 5/recruit	Not stated	Yes
15	Toruńczyk-Ruiz 2014	2010	Not stated	Ukrainian migrants	Migration studies	Warsaw, PL	7	546	1.3%	F2F	Not stated	Not stated	Not stated
16	Henny et al. 2019	2011	15	Black & Latino bisexual men	Public health	NYC, US	Not stated	37	NA	F2F	60USD	Not stated	Not stated

Study Number	Article Authors	Year	Duration (months)	Target Population	Field	Locality	# of Seeds	Total Sample	Ratio	RDS Type	Incentive	CBPR	Formative research
17	MacQueen et al. 2015	2011-2012	1	Black young adults	Public health	Durham, US	12	513	2.3%	F2F	50USD + 10/recruit	Yes	Yes
18	Górny and Napierała 2015	2012	4	Central Eastern European migrants	Methods	Warsaw, PL	6	510	1.2%	F2F	10EUR + 5/ recruit	Not stated	Yes
19	Franks et al. 2018	2012-2015	39	Black MSM	Public health	NYC, US	20	663	3.0%	F2F	5USD/ recruit	Not stated	Yes
20	Liu et al. 2018	2013	4	Burmese refugees	Environmental studies	Buffalo, US	5	205	2.4%	F2F	75USD + 15/recruit	Not stated	Yes
21	Cabrera Tineo et al. 2022 Dillon, De La Rosa, and Ibañez 2013 Dillon et al. 2013 Sanchez et al. 2015	2013-2014	12	Young adult Latino immigrants	Public health	Miami, US	Not stated	527	NA	F2F	45USD	Not stated	Not stated
22	Hotton et al. 2018 Hotton et al. 2019 Hotton et al. 2020 Morgan et al. 2016 Voison et al. 2017	2013-2014	14	YA Black MSM & TGW	Public health	Chicago, US	62	618	10.0%	F2F	60USD + 20/recruit	Not stated	Not stated
23	Rotondi et al. 2017	2015	12	Indigenous Canadians	Public health	Toronto, CA	20	917	2.2%	F2F	20CAD + 10/recruit	Yes	Not stated
24	Westgard et al. 2021	2015-2016	5	Somali immigrants	Public health	Minneapolis-St.Paul, US	11	1156	1.0%	F2F	Not stated	Yes	Yes
25	Gilbert et al. 2018	2016	2	Latinos	Public health	Ottumwa, US	11	24	45.8%	F2F	25USD + 5/ recruit	Yes	Yes
26	Hamdiui et al. 2018	2016	4	Moroccan-Dutch	Public health	Netherlands	242	407	59.5%	F2F & webRDS	5, 10, or 25EUR	Not stated	Not stated
27	Lee, Ong, and Elliott 2020 Lee et al. 2021	2016	22	Korean immigrants	Methods	LA County, MI, US	223	638	35.0%	webRDS	Not stated	Not stated	Not stated
28	Weinmann et al. 2019	2017	3	Syrian refugees	Public health	Munich, DE	16	195	8.2%	webRDS	5EUR + 5/ recruit	Not stated	Not stated
29	Amegbor and Rosenberg 2020	2017-2018	14	African immigrants	Public health	Toronto, CA	12	273	4.4%	Not stated	Not stated	Not stated	Not stated
30	Wirtz et al. 2021	2017-2019	27	Young adult Black & Latino SGM	Public health	Baltimore, Philadelphia, Washington DC, US	Not stated	405	NA	F2F & webRDS	50USD + 5-15/ recruit	Not stated	Yes
31	Duncan et al. 2019	2018	19	Black MSM	Public health	Chicago, US	Not stated	259	NA	F2F	20USD + 20/recruit	Not stated	Not stated
32	He et al. 2021	2018	7	Burmese refugees	Environmental studies	WI, US	12	103	11.7%	F2F	60USD + 15/recruit	Not stated	Yes
33	Hipp, Kohler, and Leumann 2019	Not stated	Not stated	Migrant home care workers	Methods	Berlin, DE	4	89	4.5%	F2F	40EUR + 8/ recruit	Not stated	Yes

Study Number	Article Authors	Year	Duration (months)	Target Population	Field	Locality	# of Seeds	Total Sample	Ratio	RDS Type	Incentive	CBPR	Formative research
34	Sadlon 2022	2018-2019	Not stated	Polish migrants	Religious studies	Ireland	Not stated	520	NA	F2F	Not stated	Not stated	Not stated
35	Rivera, Carrillo, and Braunstein 2021	2019	6	Black & Latino high-risk heterosexuals	Public health	NYC, US	9	515	1.7%	F2F	Not stated	Not stated	Yes
36	Rivera, Lopez, and Braunstein 2023	2019	6	Black & Latino TGW	Public health	NYC, US	10	303	3.3%	F2F	50USD + 15/recruit	Not stated	Yes
37	Coombs et al. 2014	Not stated	7	Black MSM & TGW	Public health	San Francisco, US	17	32	53.1%	F2F	25USD + 10/recruit	Not stated	Yes
38	Mullo, Sánchez-Borrego, and Pasadas-del-Amo 2020	Not stated	5	Young adult Indigenous, Afro-Ecuadorians	Methods	Riobamba, EC	10	814	1.2%	webRDS	1 lottery entry + 1/recruit	Not stated	Yes
39	Vershinina and Rodionova 2011	Not stated	Not stated	Ukrainian migrants	Sociology	London, UK	1	20	5.0%	F2F	Not stated	Not stated	Not stated

Notes

Immigrants is used to refer to individuals who have settled in their new location. Migrants is used to refer to individuals engaged in circular migration.

MSM = men who have sex with men.

TGW = transgender women.

SGM = sexual and/or gender minorities.

F2F = face-to-face (in person).

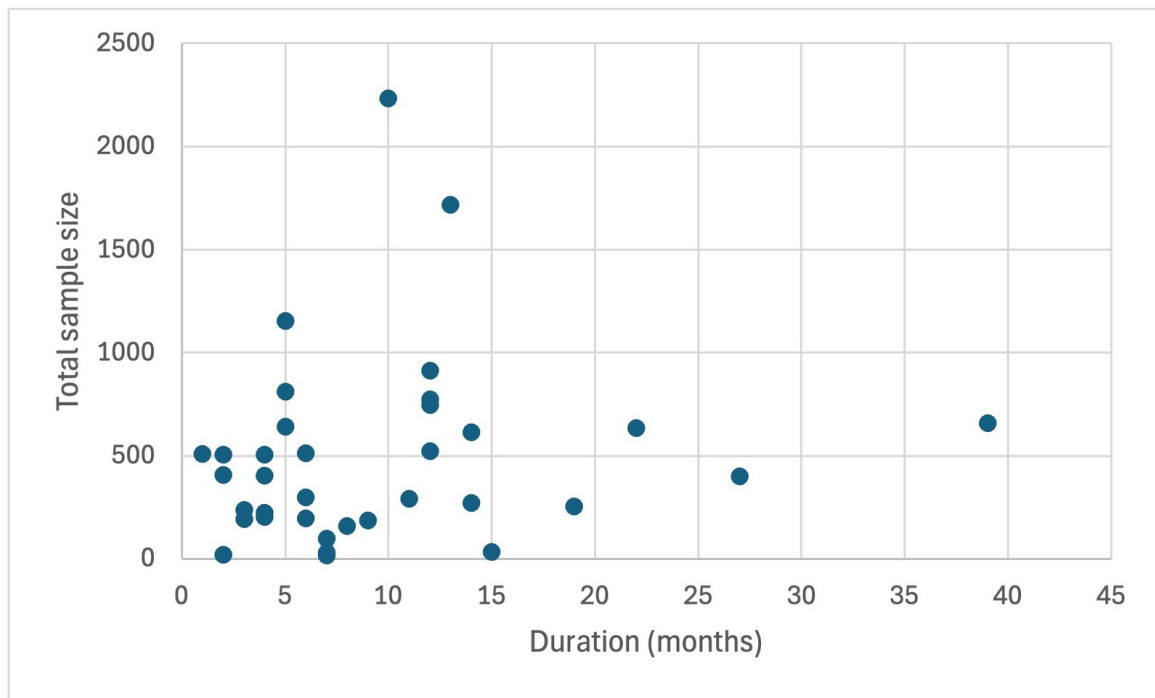


Figure 4. Study duration and sample size

Twenty-three studies were conducted in the US, four in the UK, and two each in Canada, Germany, and Poland. The remaining six studies were conducted in further countries in South America, Europe, and South-East Asia. In the US, most studies focused on ethnic minority individuals who were also either sexual or gender minorities or engaged in behaviors of interest (e.g., fatherhood, immigration, transactional sex), as other methods of identifying members of larger ethnic groups (e.g., Black, Latino) are available. Of these, immigrants, particularly Latino immigrants (four studies) comprised the largest group (eight studies). Only three studies considered rare ethnic populations, such as Korean Americans (Lee, Ong, and Elliott 2020; Lee et al. 2021) and Burmese refugees (He et al. 2021; Liu et al. 2018). In contrast, studies from non-US countries focused largely on individuals with direct migration experience; a quarter of studies (four) targeted non-migrant ethnic minorities: native Dutch of Moroccan descent (Hamdiui et al. 2018), indigenous Canadians (Rotondi et al. 2017), indigenous Ecuadorians (Mullo, Sánchez-Borrego, and Pasadas-del-Amo 2020), and Roma (Djonc et al. 2013).

Eight studies provided no information on incentives provided to either seeds or recruits. Following generally accepted practice (Liem and Hall 2020; World Health Organization 2013), most studies implemented a dual incentive scheme, in which all study participants receive an incentive, while recruiters receive an additional incentive for each individual successfully recruited. Incentives ranged from the equivalent of 5-75 USD for the participation incentive and 5-20 USD per recruit. Three studies (six articles) provided only participation incentives (approximately 5-60 USD). Franks et al. (2018)

provided only a recruitment incentive (5 USD), while Mullo, Sánchez-Borrego, and Pasadas-del-Amo (2020) provided lottery tickets as incentives. Studies with the highest ratios of seeds to total sample (i.e., in which seeds make up a large proportion of those sampled) provided the lowest incentives (5-25 USD), but several studies with lower incentives still reported low seed/sample ratios (e.g., Denson et al. 2017; Franks et al. 2018; Górny and Napierała 2015; Weinmann et al. 2019).

Five studies (nine articles) conducted RDS as part of a larger community-based participatory research (CBPR) project. While four of these studies have some of the lowest seed/sample ratios (ranging from 1.0% to 8.9%), due to limited information about the role of CBPR in these studies, I am unable to draw any conclusions. Stronger evidence exists for the importance of formative research in ensuring successful implementation. Sixteen of the 21 studies which conducted formative research had low seed/sample ratios (ranging 1.0% to 11.7%). The one study which stated the authors did not conduct formative research (Evans et al. 2011) had one of the highest seed/sample ratios (85%).

In the next section, I discuss in further detail several factors which contribute to the likely success or failure of RDS studies with ethnic minority populations. Additionally, I provide practicable recommendations for researchers looking to implement such studies.

Discussion and implications for best practices

Recommendation 1: Conduct formative research and build trust in the pre-fielding phase.

Conducting formative research before fielding allows researchers to investigate whether the target population is in fact socially networked (Djonc et al. 2013; Platt, Luthra, and Frere-Smith 2015; Wirtz et al. 2021), as well as identify other potential barriers. Many ethnic minorities experience intersectional vulnerabilities such as poverty, poor health access, or unstable or poor living and working conditions, which may necessitate adaptations to the study design (Gilbert et al. 2018; Gilbert and Rhodes 2014; Montealegre et al. 2013). Formative research also provides an opportunity to build community trust and identify possible seeds (Ramirez-Valles et al. 2005; Rotondi et al. 2017).

Trust-building is essential for successful recruitment of minority groups (Gilbert et al. 2018; Górny and Napierała 2015; Weinmann et al. 2019; Westgard et al. 2021), due to harmful legacies of research and data collection (Nobles 2001). Researchers demonstrate trustworthiness not only through the development of community partners and relationships (Gilbert et al. 2018; Djonc et al. 2013; Rhodes et al. 2013), but also through thoughtful study design choices, e.g., using coupons which reduce risk to respondents

(Rivera, Lopez, and Braunstein 2023; Montealegre et al. 2013), conducting interviews in neighborhoods or neutral spaces considered safe by participants (Hipp, Kohler, and Leumann 2019; Montealegre et al. 2013), and allowing respondents to participate in their preferred language (Platt, Luthra, and Frere-Smith 2015).

In this review, just over 60% of the 26 studies with seed/sample ratios under 25%¹ noted the use of formative research in the planning stage. While insufficient evidence is available to definitively state that not conducting formative research will result in high seed/sample ratios, Evans et al. (2011) do themselves make that argument.

Recommendation 2: Work with community partners to choose enthusiastic, diverse seeds with larger social networks.

Recommendation 3: Identify more potential seeds than necessary; additional seeds may prove useful if recruitment slows.

RDS, by definition, places the burden of recruitment on the study participants. Multiple studies noted the importance of good seed selection and training as factors in their success. Rotondi et al. (2017) found that diverse seeds selected in consultations with community partners were better able to engage the broader indigenous Canadian community and sustain recruitment through multiple waves. Rhodes et al. (2013) similarly note the importance of partnering with community organizations to select seeds. Gilbert et al. (2018) found that the most productive seeds were those who were younger and in better health. Lee, Ong, and Elliott (2020) also found a higher likelihood of coupon redemption among participants with larger networks. Furthermore, both Rotondi et al. (2017) and Lee, Ong, and Elliott (2020) found adding more seeds over time improved recruitment speed.

Recommendation 4: Provide translated study materials and/or trained bilingual interviewers when working with foreign language speakers.

Multiple studies cited possible language barriers as reasons for low response among migrant populations (Montealegre et al. 2013; Tyldum 2021; Weinmann et al. 2019). However, low fluency in the destination country language does not mean that target individuals have low literacy rates in general; Wangroongsarb et al. 2011 noted that while Cambodian and Burmese refugees in Thailand had low Thai literacy, they had sufficient native language literacy for written study materials to be of value.

¹ An arbitrary cutoff, but one indicating that on average, each original seed ultimately produced three recruits.

While surveying participants in their preferred language does not guarantee high response rates (Hipp, Kohler, and Leumann 2019; Lee, Ong, and Elliott 2020; Lee et al. 2021), it does appear to improve response as well as diversify participants, thereby reducing selectivity bias (Evans et al. 2011; Denson et al. 2017; Hamdiui et al. 2018; Gilbert et al. 2018; Lee, Ong, and Elliott 2020).

Recommendation 5: Distribute appropriate incentives.

The determination of appropriate incentive amounts, particularly with vulnerable populations, can be ethically fraught (Liem and Hall 2020; Singer and Bossarte 2006), and is outside the scope of this review. Only two studies noted specific factors considered: average hourly wage of target population (Górny and Napierała 2015), and burden (time, cost) of participation (Evans et al. 2011). Similar to Johnston et al.'s (2008) findings, neither the absolute monetary value nor the type of incentive scheme (dual vs. participation only) appears definitively correlated with success. Several studies with lower incentives still reported low seed/sample ratios (e.g., Denson et al. 2017; Franks et al. 2018; Górny and Napierała 2015; Weinmann et al. 2019). Furthermore, Kogan et al. (2011) found that participants were motivated more strongly by helping their friends receive incentives than the recruitment incentives.

Recommendation 6: Design coupons appropriate for the habits and vulnerabilities of target populations; use virtual coupons (webRDS) as a default.

Only five studies (six articles) used virtual coupons; two of these (Hamdiui et al. 2018; Wirtz et al. 2021) in combination with physical coupons. However, implementation of webRDS does not appear to be negatively associated with recruitment success. In fact, Lee, Ong, and Elliott (2020) and Lee et al. (2021) report high success with virtual coupons; the Korean Americans sampled shared coupons via popular messaging apps, email, and phone conversations, allowing participants to recruit network contacts who were more geographically dispersed. Furthermore, they found that 27.3% of participants shared coupons using multiple modes (Lee, Ong, and Elliott 2020) and that younger recruits were more engaged with the virtual coupons (Lee et al. 2021). Rivera, Lopez, and Braunstein (2023) also found that virtual coupons allowed seeds to recruit a wider range of contacts.

The use of virtual coupons also removes the necessity of printing sufficient coupons in multiple languages (Evans et al. 2011). As with other study materials, providing coupons in the recruit's preferred language reduces barriers to recruitment, increasing the likelihood of success (Lee et al. 2021).

Finally, virtual coupons reduce the risk of outing vulnerable populations, as there is less risk of the coupon being discovered (Montealegre et al. 2013; Rivera, Lopez, and Braunstein 2023). The use of webRDS, including

conducting the survey online, is an increasingly productive method of recruiting rare or vulnerable populations (Evans et al. 2011; Lee et al. 2021) by removing barriers such as irregular schedules and the necessity of operating in a non-native language or with a translator (Gilbert et al. 2018; Montealegre et al. 2013).

Conclusion

This article presents the results of a scoping review of RDS studies with ethnic minority populations. I find that it is possible to conduct successful RDS studies with a range of ethnic minority populations, including specific subpopulations such as sexual and gender minorities and immigrants. I also identify several factors contributing to the likely success or failure of such studies. While factors such as mode of survey, incentive amount and type of scheme (dual vs. participation only) do not correlate strongly to high sample response, the use of native-language materials, seed selection, and degree of community trust do appear to improve both survey response and sample diversity. Multiple studies noted the importance of formative research to build trust and inform study design, including on elements such as study language, incentives, and coupon design and mode. Some of these themes echo Theorin and Lundmark's (2024) focus group study of immigrants in Sweden as well as Singh et al.'s (2018) systematic review of ethnic minority retention. Based on these findings, I provide six recommendations for implementation.

While this article addresses the methodological gap for practicable guidance for implementing RDS with ethnic minority populations, more research must be conducted. Furthermore, authors of such research should follow the STROBE-RDS guidelines (White et al. 2015). The need for high-quality data for ethnic minority populations and other demographic subgroups will only continue to grow with time, and so must our knowledge base of ethical, practical, and reliable methodological solutions.

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