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Applying the Health Capability Profile to empirically study chronic hepatitis B in rural Senegal: a social justice mixed-methods study protocol

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Note from the Editors: Instructions for reviewers of study protocols

Since launching in 2011, BMJ Open has published study protocols for planned or ongoing research studies. If data collection is complete, we will not consider the manuscript.

Publishing study protocols enables researchers and funding bodies to stay up to date in their fields by providing exposure to research activity that may not otherwise be widely publicised. This can help prevent unnecessary duplication of work and will hopefully enable collaboration. Publishing protocols in full also makes available more information than is currently required by trial registries and increases transparency, making it easier for others (editors, reviewers and readers) to see and understand any deviations from the protocol that occur during the conduct of the study.

The scientific integrity and the credibility of the study data depend substantially on the study design and methodology, which is why the study protocol requires a thorough peer-review.

BMJ Open will consider for publication protocols for any study design, including observational studies and systematic reviews.

Some things to keep in mind when reviewing the study protocol:

- Protocol papers should report planned or ongoing studies. The dates of the study should be included in the manuscript.
- Unfortunately we are unable to customize the reviewer report form for study protocols. As such, some of the items (i.e., those pertaining to results) on the form should be scores as Not Applicable (N/A).
- While some baseline data can be presented, there should be no results or conclusions present in the study protocol.
- For studies that are ongoing, it is generally the case that very few changes can be made to the methodology. As such, requests for revisions are generally clarifications for the rationale or details relating to the methods. If there is a major flaw in the study that would prevent a sound interpretation of the data, we would expect the study protocol to be rejected.

Applying the Health Capability Profile to empirically study chronic hepatitis B in rural Senegal: a social justice mixed-methods study protocol

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Abstract

Introduction

Despite the early implementation of hepatitis B vaccination and the on-going decentralization of chronic hepatitis B (CHB) care, over 10% of the Senegalese adult population lives with CHB and liver cancer remains a main cause of death. Investigating factors associated with CHB infection, prevention of CHB-related morbidity, and prevention and treatment of mortality secondary to CHB calls for a holistic and multidimensional approach. This paper presents the adaptation of the health capability profile (HCP) to a specific epidemiological issue and empirical setting: it seeks to identify and analyze interrelated abilities and conditions (health capabilities) in relation to the CHB epidemic in the rural area of Niakhar, Senegal.

Methods and Analysis:

This ongoing study relies on a sequential social justice mixed-methods design. The HCP is comprehensively adapted to CHB in rural Senegal and guides the design and conduct of the study. Objective and subjective data are collected at the individual level following a mixed methods explanatory core design. The quantitative module, embedded in the ANRS12356 AmBASS cross-sectional survey (exhaustive sampling), is used to select a purposeful sampling of participants invited for one-on-one qualitative interviews. Additional data is collected at the institutional and community level through health facility surveys and an ethnography (in-depth interviews) of local and national CHB stakeholders. Data analysis adopts a synergistic approach to produce a multilayered analysis of individual health capability profiles and crosscutting analysis of the fifteen health capabilities. The data integration strategy relies on a mixed methods convergent core design, and will use 0-100 health capability scores as well as flow diagrams to measure and characterize levels of development and interactions among health capabilities respectively.

Ethics and dissemination:

This study was approved by Senegalese and French authorities. Results dissemination through local workshops and scientific publications aim at fueling effective policy change towards CHB-related health capability.

Keywords: health capability model; health capability profile; social justice mixed-methods study; chronic hepatitis B; Senegal; rural.

Article summary

Strengths and limitations of this study

- This is the first social justice mixed-methods study to adapt the entire health capability profile (conceptual framework) in Senegal and for chronic hepatitis B (CHB).
- This study will provide a comprehensive overview of cumulative abilities and conditions that are relevant to CHB-related morbidity and mortality in rural Senegal, and help illuminate processes for achieving optimal health capability.
- As an empirical investigation, this study has the potential to serves as a model for future adaptations of the health capability profile to different health issues and empirical settings using the indicative scoring table and dynamic flow diagrams presented in this paper.
- The main limitation of the study is one of external validity as results will be specific to CHB in the rural area of Niakhar in Senegal.

Introduction

Chronic hepatitis B (CHB) virus infection: a "silent epidemic" and global public health issue

With over 800,000 annual deaths worldwide attributed to cirrhosis and liver cancer secondary to chronic hepatitis B (CHB) according to 2017 WHO estimates[1], CHB has been referred to as "the silent epidemic" whose burden is comparable to those of HIV, tuberculosis or malaria[2]. In 2016, the WHO General Assembly committed to viral hepatitis elimination by 2030 with a three pillars strategy: prevention, testing, and treatment. Primary prevention of CHB infection relies on vaccination with an efficient vaccine available since the 1990s. The vaccine is usually administered in a three doses schedule – including a birth dose in some endemic areas, and has been found to be cost-effective, including in low-and-middle income countries[3]. The second pillar, testing, is key to identify people who are CHB patients since CHB infection is often asymptomatic in its early stages[4]. Third, life-long monitoring is essential to know when, if ever, life-long anti-viral therapies should be prescribed to control virus replication, and avoid CHB-related complications, specifically liver damage, cirrhosis and even liver cancer[5, 6]. Halfway assessments of reaching the WHO targets of a 90% reduction in new cases and a 65% reduction in mortality by 2030 have called for global investments[7], regional strategies[8], and a focus on countries with the greatest burden[9].

CHB response in Senegal

CHB prevalence is the highest in the Western Pacific region (6.2%) and in Africa (6.1%)[1]. Senegal was the first country in the Sub-Saharan African region to set up a National Viral Hepatitis Program in 1998. In this country, an estimated 8 to 10% of the population currently lives with CHB[10]. Hepatitis B vaccination was introduced in the expanded program on immunization starting in 2004 through the three dose pentavalent vaccine, with the addition of an extra dose within 24 hours of birth since 2016. Non-institutional stakeholders include the "Saafara Hépatites" patients association and the gastroenterology and hepatology Senegalese society (SOSEGH) that gathers medical experts. Anti-viral therapies that can control viral replication (but do not cure from chronic infection) are offered at a

subsidized monthly price of 5,000 CFA (about 8 USD), and in 2018 the Ministry of Health together with the National Viral Hepatitis Program announced the decentralization of CHB care to regional hospitals and reference healthcare facilities at the district level [11].

Despite the country's early response, the mobilization of civil society, and the existence of both preventative and curative options, Senegal is one of the only African countries to have seen an increase in estimated CHB prevalence between the late 1950s and the early 2000s [12]. Nowadays, liver disease secondary to viral hepatitis remains one of the leading cause of cancer[13], particularly among adult Senegalese men and women who were born before the successful implementation of the vaccination program [14].

Standard approaches to CHB-related morbidity and mortality in Sub-Saharan Africa, and in Senegal

Most studies conducted in Sub-Saharan Africa have focused on the role of health services organization and delivery and identified long waiting times [15], delays in administration of the birth dose [16], opportunistic rather than systematic vaccination [17], or insufficient screening [18] as major barriers to reaching the WHO target of CHB elimination by 2030 [8]. Individual factors associated with CHB infection in sub-Saharan Africa include demographic characteristics such as age, gender or education level [19–21], customs, specifically home delivery, scarifications/tattooing, circumcision or shared items[22, 23], and medical history of surgery, injectable medication, or family history of liver disease[24].

In Senegal, previous studies have particularly highlighted limited hepatitis B-related knowledge, both among lay population [25] and healthcare workers, from nurses in local dispensaries [26] all the way to physicians working in Dakar hospitals [27]. Factors related to health services organization and delivery, such as the fact that CHB testing and bi-annual follow-up exams remain costly (up to 75 USD for the latter) and are rarely available at local healthcare facilities, have also been documented as potential obstacles to CHB prevention and linkage-to-care in Senegal [28].

Finally, societal factors such as stigma attached to CHB infection and discrimination of CHB patients have long been a blind spot of studies conducted in the African region [29]. To the best of our knowledge, it remains undocumented in Senegal despite recent evidence in Ghana[30, 31], Zambia [32], Uganda [33] or Cameroon [34].

The Health Capability Profile: a multi-dimensional and in-depth framework

Compartmentalizing these factors and focusing on individual or social indicators in an *ad hoc* and fragmented manner, fails to provide a full picture of what dynamically plays into people's ability to avoid CHB-related morbidity and mortality in their complex lived experiences. A thorough investigation requires a more comprehensive, multi-dimensional and in-depth framework, such as the health capability profile [35].

The health capability profile identifies eight individual abilities (internal health capabilities) and seven societal abilities or conditions (external health capabilities), that interact with each other and together create people's ability to effectively achieve optimal health given one's biological predispositions, one's cultural and socio-economic environment, and available healthcare services and public health infrastructure [35] (see Table 1).

Table 1. The Health Capability profile [35]. Each health capability comprises one or several (number in parenthesis) domains.

Health Capabilities	
Internal	*External*
• Health status and health functioning (2) • Health knowledge (4) • Health-seeking skills and beliefs, self-efficacy (3) • Health values and goals (4) • Self-governance and self-management and perceived self-governance and management to achieve health outcomes (5) • Effective health decision-making (4) • Intrinsic motivation • Positive expectations	• Social norms (6) • Social networks and social capital for achieving positive health outcomes (3) • Group membership influences • Material circumstances (6) • Economic, political, and social security • Utilization and access to health services (5) • Enabling public health and health care systems (3)

The health capability profile generates an understanding of the integrative and multi-dimensional experience for individual health conditions, risk factors and health-related behaviors, the individual abilities of self-efficacy, perception, knowledge or motivation, and societal conditions – including, but not limited to, social norms, social networks, and material circumstances.

The health capability profile recognizes important advances of the biomedical model of disease [36], health belief models [37, 38] and social determinants of health [39–42]. However, compared with these alternative frameworks, the health capability profile builds on the basic idea that manifestations of diseases are the result of cumulative interactions of various capabilities. The profile is a dynamic framework that examines the combination, interrelatedness and interdependence of internal (individual) and external (societal and environmental) health capabilities in relation to risk of diseases, and resilience towards health and wellness.

Another attractive feature of the health capability profile is that it focuses on the identification of gaps between observed health capabilities, and an optimal level of health capability. It therefore contributes to the emerging field of implementation science [43–45], which seeks to ensure that evidence-based research (here, optimal health capabilities) translate into practice (observed health capabilities).

Last, but not least, the health capability profile contains a normative dimension. Drawing from the concept of human flourishing , the health capability paradigm reasons that individuals and societies work together towards the reduction of escapable morbidity and premature mortality – central health capabilities[46]. It advances normative principles on how to intervene to improve individual health capability profiles – tracking this overtime with the aim of moving from risk to resilience, individual and collective [46]. The health capability profile can hence provide powerful guidance for health policy design and evaluation.

Objectives

The overall objective of this study is to study CHB-related morbidity and mortality in rural Senegal using the health capability profile.

Secondary objectives

The secondary objectives are twofold. First, there is a methodological aspect, which is to adapt the health capability profile in order to investigate a contextualized public health issue, specifically CHB in rural Senegal.

Secondary objectives are also of an empirical nature:

(1) To quantify and characterize gaps between observed and optimal health capabilities relevant to CHB in rural Senegal, and document interactions among these health capabilities.

(2) To distinguish strengths and vulnerabilities that are peculiar to CHB patients, in particular in relation to entry into, and retention in CHB care. This includes an anthropological perspective to account for cultural and social aspects that are at play in rural Senegal.

(3) To identify marginalized CHB-related health capabilities (at the community level) and marginalized individual health capability profiles, and investigate positive examples of advanced levels of development of CHB-related health capabilities.

(4) To draw from the profile to help inform and prioritize short and long term policy change towards the elimination of CHB-related morbidity and mortality, or in other words, towards CHB-related Health Capability for all people living in rural Senegal.

Methods/Design

Study Setting

The study takes place in the Niakhar Health and Demographic Survey System [47] (HDSS), in Senegal, a rural area located 135km east of the capital, Dakar. The HDSS covers 30 villages, home of over 45,000 inhabitants (2018 census), which has been under demographic surveillance since 1962. Mortality tables and immunization records are available for all residents. The Niakhar HDSS, situated in the middle of the Fatick region, has a long history with the Senegalese hepatitis B response. Between 1978 and 1981, the area hosted one of the first hepatitis B vaccine trials conducted in Africa [48], and in July 2018, the Fatick region was appointed a pilot region for the decentralization of CHB care by the Senegalese National Viral Hepatitis Program [11]. More recently, the ANRS 12356 AmBASS survey on the burden of CHB took place between October 2018 and July 2019 in the Niakhar HDSS. Three hundred households were randomly selected, and all residents over 6 months of age were invited to participate to hepatitis B home testing, and to be interviewed using standardized face-to-face questionnaires [49]. In a second step, participants who tested positive to CHB undertook further exams to assess the stage of their disease, and treatment was provided to those eligible. In total 3,118 participants representative of the Niakhar HDSS population were recruited, among which 1,505 were born before September 2003 (hereafter adults), and 206 tested positive for CHB (a 7.1% CHB prevalence in the general population; 12.6% in the adult population)[14].

Adaptation of the conceptual framework

The Health Capability Profile's general framework was comprehensively adapted to the context of the empirical study, specifically CHB in rural Senegal (see Table 2). First, the profile focuses on information relevant to CHB infection in the Niakhar area including hepatitis B transmission routes –blood and sexual fluids –, the natural history of the disease as well as risk factors and behaviors, in particular alcohol use, a main factor associated with liver fibrosis in Western Africa [50] as is peanut consumption [51], the Niakhar area's main cash crop. Prevention of CHB-related morbidity and mortality is also at

the heart of the adapted profile through a focus on knowledge on, access to, and utilization of hepatitis B testing and vaccination, CHB care and anti-viral treatment options.

Second, the profile expresses elements of rural Senegal and the Niakhar HDSS, such as social norms in relation to the cultural and religious beliefs of the population of Serer ethnic group and majority Muslim [47] or the importance of traditional medicine [25]. Similarly, social capital and networks emphasize informal neighborhood groups, extended households, weekly markets, going to the mosque and membership in football teams, whereas material circumstances account for the area's hot weather, unpaved roads, informal work, and seasonal work migration[52]. In particular, the profile will capture the impact of geographic mobility (in terms of knowledge, economic capacity, etc.), and its relationship with the socio-cultural construction of the etiology of hepatitis B as well as with possible treatment routes (in Niakhar and elsewhere).

Additionally, the profile appeals to all stakeholders involved in CHB care and policy in Senegal, both the national level (such as the Viral Hepatitis Program, the Ministry of Health, the Society of Senegalese Hepatologists and Gastroenterologists, the Saafara Hépatites Patients Association, etc.), and at the local level – specifically community-based healthcare workers (*bajenu gox*), healthcare providers, and the center of traditional healers.

Table 2. Adaptation of the Health Capability Profile to CHB in Rural Senegal

Health capabilities	CHB-related health capabilities in rural Senegal
Health status and health functioning	1. Self-reported health status 2. Health conditions 2.1 CHB-related health conditions ○ CHB status, and disease evolution if applicable ○ Hepatitis B vaccination status ○ Risk factors, including alcohol use 2.2 Other health conditions
Health knowledge	1. Knowledge on one's own hepatitis B and vaccination status 2. Knowledge on hepatitis B transmission routes, disease evolution, vaccination, testing and treatment 3. Knowledge on behaviors that are CHB risk factors (alcohol use, nutrition, obesity) 4. Modes of health and CHB information gathering: health care providers, Internet, newspapers, radio, Saafara Hepatitis patients' association, traditional healers, etc.
Health seeking skills and beliefs, self-efficacy	1. Belief in one's ability to avoid hepatitis B infection, or transmission and CHB-related complications 2. Ability to acquire CHB-related skills, and apply them: learning to monitor CHB condition and avoid infection or transmission (vaccine, hygiene, protection) 3. Confidence in ability to perform or abstain from CHB-related health behaviors such as avoiding alcohol use, adapting diet, etc.
Health value and goals	1. Valuing one's health in general 2. Valuing the prevention of hepatitis B infection and transmission or CHB-related complications 3. Valuing CHB-related lifestyle or behaviors: change in diet (including alcohol use), hygiene, etc. 4. Recognizing and countering social norms detrimental to CHB prevention and monitoring
Self-governance and self-management and perceived self-governance and management to achieve health outcomes	1. Ability to be in control of one's life, to set and reach objectives in general 2. Ability to handle one's workload within the extended household *[children, household work, farming, etc.]* and outside *[migration for economic activity or studies, etc.]* 3. Ability to control one's behaviors for health or CHB-related purposes e.g., avoiding rich family meals, or situations that involve alcohol 4. Ability to seek out support (help from family, neighbors) and obtain resources (including transportation or financial means) to access hepatitis B testing, vaccination or treatment
Effective health decision-making	1. Ability to use CHB-related knowledge and available resources to avoid infection, transmission or disease evolution 2. Ability to weigh the short- and long-term costs and benefits of CHB-related behaviors and actions, including alcohol use

	3. Ability to identify CHB-related symptoms (in particular jaundice) and pursue vaccination, testing, follow-up and/or treatment. 4. Ability to make healthy choices in relation to CHB: reducing alcohol consumption, not sharing hygiene equipment, etc.
Intrinsic motivation to achieve desirable health outcomes	Quantifying motivation to avoid hepatitis B infection, transmission or CHB-related complications, and exploring whether it is internally (personal assessment) or externally (e.g., pressure from relatives or healthcare providers) motivated.
Positive expectations about achieving health outcomes	Optimistic or pessimistic viewpoint on personal life and CHB-related health prospects (avoiding infection, transmission and/or complications).
Social norms	1. Social norms on hepatitis B in relation to national and international recommendations 2. Favorable or unfavorable views on hepatitis B vaccination, on people living with CHB, alcohol use, and condom use 3. Quantification and characterization of people that undertake CHB vaccination and testing or adapt diet (including reducing alcohol consumption) 4. Discrimination or anti-discrimination of people living with CHB and of people seeking to access vaccination, testing or care (e.g., people with alcohol use disorder) 5. Norms on decisional latitude or power in relation to health in general, and CHB in particular 6. Changes, and resistance to social norms relevant to CHB (e.g., vaccination, alcohol use, healthcare access)
Social network and social capital	1. Ability to ask for instrumental help (for instance delegating tasks for CHB prevention or care purposes), and ability to talk about one's problems including the disclosure of CHB status 2. Existence of patients' association, or other groups/networks that can support and provide information to people in relation to CHB 3. Existence of social networks or groups of people that have a detrimental impact in relation to CHB (e.g., discriminatory practices or sharing of false information)
Group membership influences	Membership to any kind of community organization (union or political party, sports team, association, informal), or informal group that may provide instrumental or emotional support, or counterbalance/augment social norms relevant to CHB.
Material circumstances	1. Economic activity (formal or informal, part or full-time), and monetary resources 2. Neighborhood's quality of life and resources including access to healthcare facilities 3. Water source, waste management and latrines system 4. Housing status and quality (in particular crowding and heat protection) 5. Availability and quality of food (specifically dependency on peanuts) 6. Other CHB patients and other sources of pollution or disease in the immediate environment (soil, air, malaria…)
Economic, political, and social security	1. Economic security: availability, quality and security of jobs (temporary versus permanent job, wage, unemployment protection and insurance, sick leaves)

	2. Political security: existence of institutions (including the judiciary) and elected representatives that represent the people's interests, and prevent violence and criminal activity 3. Social security: existence and quality of financial, old age, or disability protection schemes (e.g., pensions, access to bank accounts) Including pessimistic and /or optimistic outlook
Utilization and access to health services	1. Symptoms of CHB-related health issue (jaundice, advanced liver disease) 2. Other serious or morbid symptoms of poor health 3. Perception of a need to see a healthcare provider (vs. traditional medicine or non-) 4. Existence of CHB-related health services: availability of vaccination, testing, CHB follow-up exams and consultation 5. Barriers to access: geographic accessibility, waiting times, costs, etc.
Enabling public health and healthcare systems	Extent to which healthcare facilities and health authorities (ministry representatives, physicians, dispensaries, health center, regional hospital and hospitals in Dakar) are doing the following: 1. Giving information and helping people take charge of CHB prevention and monitoring 2. Helping protect people from CHB infection, transmission and complications 3. Being efficient in providing CHB-related care, and being accountable if not

Study Design

This ongoing study follows a sequential social justice mixed methods design (see Figure 1) in that the Health Capability Profile guides the design and conduct of the research [53, 54]. A full understanding of the various health capabilities and the overall health capability of a person requires data on objective abilities and situations (e.g., CHB status, CHB knowledge, economic circumstances, etc.), as well as information on subjective experiences (including, but not limited to, perceived competency, motivation, expectations, group membership influences, perception of a need to seek health services etc.). The need for objective and subjective quantitative and qualitative data from the individual and institutional and community perspectives necessitates a mixed methods design that combines quantitative and qualitative data collection.

The first step of the study relies on an explanatory core design [54, 55] with individual level quantitative data collection followed by qualitative data collection in the form of individual interviews. The quantitative survey provides an overview of gaps and optima in health capabilities associated CHB-morbidity and mortality in the study area (objective data) and is used for the purposeful sampling of participants invited for qualitative interviews. The subsequent qualitative data collection (essentially from an anthropological perspective) helps refine and complete these results with in-depth, dynamic, and comprehensive health capability profiles, including information on personal experiences (subjective data) as well as interactions between health capabilities at the individual level, both of which cannot be properly documented with standardized questionnaires. In contrast, in-depth one-on-one interviews are particularly appropriate to gather perceptions and representations of CHB-related health behaviors, beliefs and obstacles to entry into care.

In addition, all stakeholders and elements of the Profile need to be accounted for. This includes individuals, healthcare system and healthcare professionals, institutional representatives, patients' advocates, etc. We therefore complement individual level data collection with institutional and community-based data collection through a health facility survey of CHB resources in the healthcare system and in-depth interviews with national and local CHB stakeholders. Whenever possible, these

interviews take place as focus groups in order to confront point of views and thereby identify convergence and divergence on health capability development, in particular among representative of local healthcare workers or community leaders. It is likely that national stakeholders will be involved through one-to-one interviews, which are more flexible in terms of accommodating busy schedules.

In a second step, information from interviews (qualitative data) and from individual and health facility surveys (quantitative data) are all integrated following a mixed methods convergent core design [54].

[INSERT FIGURE 1 HERE]

Quantitative survey

A specific module was designed based on the health capability profile, in conjunction with a review of empirical studies, to identify items that could document health capability domains given the study area and participants. Health status and health functioning is assessed using self-reported health (SF12v2 health survey [56]), CHB status and BMI in all participants; in addition a clinical and biological check-up (to identify liver disease stage) and CHB-risk factors are explored for participants who tested positive for CHB. Health-related knowledge is documented through general knowledge on CHB including transmission routes, clinical complications, hepatitis B vaccine and knowledge of hepatitis B testing. Health seeking skills and beliefs, and self-efficacy are measured with questions on perceived health competency [57]. Intrinsic motivation to achieve desirable health outcomes is assessed using an adaptation of the relative autonomy index [58] and social norms are measured at the individual level through last say type of questions on individual decisional latitude [59]. Data on material circumstances include the household's economic status and monetary resources, type of neighborhood, water access, housing and living conditions, food security, and the CHB status of the other household members. Finally, access and utilization of health services is documented using symptoms of poor health, healthcare utilization, and obstacles to healthcare seeking [60]. The quantitative health capability module was embedded in the demographic and socio-economic quantitative data collection of the 12356 ANRS AmBASS survey [49] and administered to all 725 adult

participants included after January 2019 (exhaustive sampling). Trained interviewers recorded answers using tablets equipped with the VoxCo software.

One-on-one interviews

All health capabilities of the profile were clarified, expressed in the context of rural Senegal, translated into French (official language of Senegal), and reworded as an open-ended question that is accessible and meaningful to all study participants in order to build the interview guide. For example, the internal factor's dimension on enabling healthcare and public health systems will be investigated through the question, "What is your perception on the work the healthcare facilities and health authorities (ministry representatives, physicians, dispensaries, health center, regional hospital and hospitals in Dakar) are doing in helping you taking care of your health, including when it comes to hepatitis B? What are the strengths and weaknesses, and how could it be improved?". The interview guide also includes an extensive list of clarification questions meant to guide interviewers in covering all 49 domains comprised in the profile (see Figure 2).

[INSERT FIGURE 2 HERE]

The preliminary interview guide was discussed, clarified and translated in Wolof and Serer during pilot interviews conducted with the participation of members of the Safaraa hepatitis patients' association. One-on-one semi-structured interviews are recorded and conducted in Serer (local language of the main ethnic group), Wolof (spoken by a majority of the Senegalese population) or French according to the participant's own preference. Recordings are erased after transliteration, and translation – for interviews conducted in Wolof and Serer – by the research team.

The selection of the AmBASS survey participants invited for a one-on-one semi-structured interview follows a purposeful sampling strategy, first, in order to interview individuals that represent the population's diversity in terms of age, gender, education level, occupation, CHB status, and healthcare utilization, and second, to represent the population's diversity in terms of CHB-health capability profile and health capability capital. Participants are contacted for interviews using these criteria, until data

saturation is reached – it is expected to happen at around 35 to 40 interviews [61]. The qualitative data collection was significantly delayed by the COVID-19 outbreak; it is currently undergoing.

Interviews with local CHB stakeholders

Additional interviews are conducted with healthcare staff involved with hepatitis B prevention or care for patients living in the Niakhar area, community health counselors (*bajenu gox*) of the Niakhar area, members of the Saafara hepatitis patients' association, and institutional stakeholders involved in CHB policy (Viral Hepatitis Program, Ministry of Health, etc.) to complement information on CHB-related external health capabilities. More specifically, these interviews are used to collect objective, community level data on CHB-related social and cultural norms, social networks and group membership influences, the political, economic and social security and the availability, safety, efficiency and accountability of health services, and of the overall healthcare system (including health and cultural beliefs and behaviors). These additional interviews are on-going and will be conducted until all types of stakeholders are represented, and after data saturation has been reached – which should happen at around 4 to 5 focus groups or a dozen of one-on-one interviews.

Health facilities survey

The survey makes an inventory of resources available in the health facilities involved with CHB patients living in the Niakhar area: the public dispensaries of Diohine, Ngayokheme, and Toucar, the Diohine private dispensary, the Niakhar and Fatick health centers, the Fatick regional hospital, and the Dakar reference hospitals for advanced liver disease secondary to CHB. The survey draws from a micro-costing methodology to document the availability and use of resources mobilized or mobilizable for CHB care, specifically human resources (headcount, general as well as specific CHB training, workload and salary base of physicians, healthcare workers, and administrative staff), equipment and facilities, medical imaging, biological exams (laboratory facility, staff, and machinery), and medication. A trained interviewer is currently conducting field visits to fill out the survey under the supervision of the research team.

Data Analysis Plan and Data Integration Strategy

A multi-layered, synergistic data analysis plan

The data analysis plan is multilayered. The first layer is the individual level through the documentation of individual health capability profiles. The second layer of analysis will consist in a crosscutting analysis of each of the fifteen health capabilities conducted at the level of the Niakhar area. The data analysis plan also draws from a synergistic approach [62] in adopting a position of equal value of qualitative and quantitative data, and aiming at producing robust qualitative, quantitative and mixed methods results (see Figure 3).

[INSERT FIGURE 3 HERE]

First, we will use data from the quantitative survey to produce descriptive statistics for each of the health capability domains that are documented in the survey (health status, knowledge, perceived competency, intrinsic motivation, social norms on decisional latitudes, material conditions, health care access and utilization either complete (participants to the quantitative survey and one-on-one interviews). Outcomes of the quantitative data analysis are the identification and quantification of gaps (e.g., low hepatitis B knowledge) or optima (e.g., high self-reported health) in those key health capabilities in the general population of the Niakhar HDSS.

Second, the qualitative data analysis will rely on deductive content analysis using the fifteen health capabilities and their domains as a coding matrix to analyze the transcription of the interviews and focus groups [40, 42]. Qualitative data will reveal interactions among health capabilities, as well as community-level health capabilities' dynamics and levels of development. This analysis will include the additional information from interviews with national and local CHB stakeholders as well as objective data from the health facility survey.

Finally, quantitative and qualitative data will follow a process of data integration to produce a mixed methods analysis of whole health capability profiles at the individual level in participants to both the quantitative survey and one-on-one interviews. The data integration strategy will rely on the use of health capability scores and flow diagrams; both these tools were developed as part of this study.

Health capability scores

First, individual-level qualitative and quantitative data will be combined to yield a 0-100 score for each of the 15 health capabilities. Some quantitative data such as Likert-scale type numeric variables can be directly turned into such a score. Other data will be transformed using an indicative scoring table (see Table 3) developed from the Dreyfus model of skill acquisition and its adaptation to clinical competence [64], and the community readiness model [65]. The 100 maximum score, or optimal level, corresponds to a normative but realistic and attainable goal that accounts for the context, both at the macro and individual levels. For internal capabilities, optimality corresponds to the level of expertise that can be attained by a layperson, for instance in individuals involved in delivering expert patient programs [66–68].

Table 3: Indicative health capability development scoring table

Score	Stage of capability development	Internal capability "The individual is…"	External capability "The conditions are…"
0	Absence/Nil	Naive	Unpropitious
10	Basic 1	Novice	Non-hindering
25	Basic 2	Advance beginner	Promising
40	Intermediate 1	Autonomous	Propitious
55	Intermediate 2	Competent	Favorable
70	Advanced 1	Experienced	Facilitating
85	Advanced 2	Proficient	Enabling
100	Optimal	Expert	Fully enabling

Two team members trained to the health capability profile will independently score profiles, with a third member solicited for scores diverging by more than 15 (i.e., a whole stage of development).

Health capability scores will then be aggregated across individuals for each of the fifteen health capabilities in order to document areas of shared strengths or vulnerability that can help inform and prioritize policy. Scores will be also be aggregated at the individual level to quantify overall level of health capability development (overall health capability set), which should allow for the identification and characterization of profiles at each end of the health capability set (i.e., strong versus vulnerable profiles). Strong profiles will be used to comprehend the dynamics behind positive examples of advanced levels of development of CHB-related health capabilities, whereas marginalized health

capability domains or profiles shall help guide policy change towards the greatest needs. However, these aggregated scores complement, but do not replace, the detailed analysis of health capabilities: the profile as a whole is what creates Health Capability.

Dynamic flow diagrams

Flow diagrams will also be used to integrate quantitative and qualitative data at the individual level (see a hypothetical example in Figure 4).

[INSERT FIGURE 4 HERE]

These diagrams help place the most relevant health capabilities on a nil to optimal development continuum, and reveal interactions between health capabilities, including cumulative building (e.g., virtuous circles or vicious circles).

Patient and public involvement

CHB patients were represented through the Saafara Hepatitis patients' association, which participated in the study design workshop and data collection training session. CHB patients, the Saafara Hepatitis patients' association, healthcare professionals, SOSEGH members and institutional stakeholders are all involved in the study through group or one-on-one interviews. They will also be invited to result dissemination workshops organized at the local (Niakhar area) regional and national levels.

Ethics and dissemination

Ethical considerations

This research respects the ethical principles advanced by the current version of the Helsinki Declaration, as well as regulations defined by legal and institutions bodies supervising research involving humans, and collection of personal data both in Senegal and in France – including the European Union General Data Protection Regulation. The study received ethical approval from the Senegalese National Ethical Committee for Research in Health (CNERS) no. 082MSAS/DPRS/CNERS on 10 April 2018, last renewed in July 2021, administrative authorisation from the Ministry of Health and

Social Action and authorisation from the French Commission on Information Technology and Liberties (CNIL) reference MMS/HG/OTB/AR181521.

Information, consent and data confidentiality

All participants were explained the design and objectives of the study and signed two copies of the informed consent form before the start of the quantitative data collection. The procedure and objectives of the qualitative data collection are also presented to participants invited for semi-directed interviews who will sign two copies of a separate inform consent form. Participants are identified using a unique, study-specific identification number (ID) that was entered in the electronic tablets during the face-to-face questionnaires (quantitative data collection). This study ID is also used to connect quantitative and qualitative data. Information that could identify participants or their relatives (such as individual names, addresses or neighborhoods) are removed during the transcription of one-on-one interviews, and recordings are erased directly after transcription. The team members in charge of data analysis therefore only have access to pseudonymous data.

Expected benefits and risks for study participants

The main risk for participants in the AmBASS survey was to learn of one's CHB status; in contrast, they benefited from free CHB-related care, specifically testing, the initial clinical exam and biological check-up, consultation in reference facilities and provision of antiviral therapy until the end of the study funding (March 2022). The study also collaborated with the Sen-B research cohort at the Fann hospital in Dakar to offer participation for AmbASS active CHB patients, which comes with fully funded CHB care for the duration of the cohort. Participation in the qualitative data collection does not entail any risks, apart from the time dedicated to the interview. All participants will benefit from results dissemination, as well information and sensitization on prevention of CHB-related morbidity and mortality.

Expected results and dissemination plan

An empirical application of the health capability profile

Using a social justice mixed methods sequential design, this study adapts the health capability profile to empirically study CHB-related morbidity and mortality in rural Senegal. To our knowledge, this is the first time to collect in one study and for each individual both individual factors such as knowledge, perceived competency, and motivation as well as social (external) factors such as social norms, type of neighborhood, social networks or living conditions, all linked to health status and health outcomes in relation to CHB. In line with recent calls for dynamic and multidimensional approaches to social conditions and factors that influence people's health[69], the health capability profile will capture a broader, multidimensional and more accurate array of interrelated factors that puts individuals at risk or to be resilient for CHB and successful CHB prevention and/or management in rural Senegal.

In addition, the health capability profile relates to the concept of positive deviance, which has been used to highlight positive, intentional departure from standard medical practice [70], with recent applications to the prevention and control of infections [71] or to health equity issues [72] beyond the realm of healthcare and public health systems. The health capability profile allows for the identification of effective or positive examples in all domains that constitute a person's health capability (including in areas such as health-related knowledge, beliefs, motivation or expectations).

Furthermore, unlike perspectives that focus solely on individual abilities and characteristics, the profile brings out collective capabilities from a sociological and anthropological point of view. For instance, the profile will document the interplay between gender-specific decision-making latitude, financial agency, health care seeking expectations and behaviors, and geographic mobility relevant to women, or reveal interactions or health capability strengths and shortfalls that are at play in marginalized populations.

For these reasons, the health capability profile will help better illuminate the most important or most influential factors or interactions of factors in the system of health production or disease creation in relation to CHB for actionable recommendations in rural Senegal, and other relevant settings.

Finally, as an empirical investigation, our study serves as a model for future adaptations (see Figure 5). While the health capability profile has been applied in other settings and populations[73, 74], this is

the first empirical mixed-methods study to adapt the entire health capability profile in Senegal and for CHB. Applications to different research questions, settings or populations, will be able to draw from our study design, data collection tools, synergistic approach to quantitative, qualitative, and mixed data analysis, and data integration strategy using capability scores and flow diagrams.

Our study presents a clear strategy for mixed methods data integration, with the use of individual flow diagrams and of a 0-100 score for each of the fifteen health capabilities derived from a detailed indicative scoring table. The provision of eight distinct levels of health capability development with corresponding descriptions for internal and external capabilities produces a refined model which should allow overcoming most of the challenges associated with data integration in mixed methods studies [75]. Our approach thereby contributes to the literature on data integration strategies[76] and provides a response to the lack of coherence which has been noted in a recent review of applications of the capability approach to the health field [77].

[INSERT FIGURE 5]

Results dissemination

Results dissemination workshops will be organized at the local (Niakhar area) regional and national levels. As per the social justice orientation of this study[53], results dissemination will aim at building on the study results to fuel discussions, actions plans and effective policy change towards HBV-related health capability for all. Results will also be disseminated through publications in scientific peer-reviewed journals, and presentations in international conferences on viral infections including hepatitis, public health, social sciences, etc.

Wordcount: 4,960 words

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Author Contributions

JPR conceived the health capability profile and substantially contributed to the conceptualization and design in its adaptation to the context of CHB in rural Senegal in supervising MC. MAB & MM substantially contributed to the design of the qualitative data collection and analysis strategies with MC. SB and AD are the principal investigators of the ANRS 12356 AmBASS survey; they oversaw the quantitative data collection. MC designed the study with contributions from AD, SB and JPR, and MC drafted the manuscript with important intellectual content in revising it from AD, JPR, and SB. All authors read and approved the final manuscript and all authors agree to be accountable for all aspects of the work.

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Competing interests' statement

The authors declare that they have no competing interests.

Consent for publication

Not applicable

Availability of data and materials

The data generated by the study are available from France REcherche Nord&Sud Sida-hiv Hépatites (ANRS-Inserm) and Aix-Marseille University but restrictions apply to the availability of these data, due to privacy/ethical reasons. Data are however available from the authors upon reasonable request and with permission of the sponsors and ethical bodies (including the French Commission on Information Technology and Liberties).

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Figure legends/captions

Figure 1: Sequential social justice mixed methods (MM) study design

[INSERT FIGURE 1]

Abbreviations:

CHB: chronic hepatitis B

MM: mixed methods

Figure 2: Illustration of the English version of the full interview guide using the internal health capability n°2, health knowledge

[INSERT FIGURE 2]

Figure 3: Illustration of the synergistic approach: type of data and expected study outcomes

[INSERT FIGURE 3]

Figure 4: Flow diagram of α's hypothetical case

[INSERT FIGURE 4]

Upon participating to the AmBASS study, α was tested positive for CHB, and the exams showed that the infection is active (1). International and national CHB care guidelines recommend a bi-annual follow-up, including a consultation at the local dispensary as well as a viral load and Fibroscan imagery, which are only available in Dakar, and at a non-negligible cost (2). α's community-based health insurance doesn't cover any of these costs (3). α uses all the household's savings (4), and further borrows from relatives (5). α also joined the Saafara Hépatites patients' association, which helps α remain motivated, and have positive expectations (7). α manages to be followed up for CHB care (8), which should help prevent further complications (9).

Abbreviations:

CHB: chronic hepatitis B

Figure 5: Applying the health capability profile

[INSERT FIGURE 5]

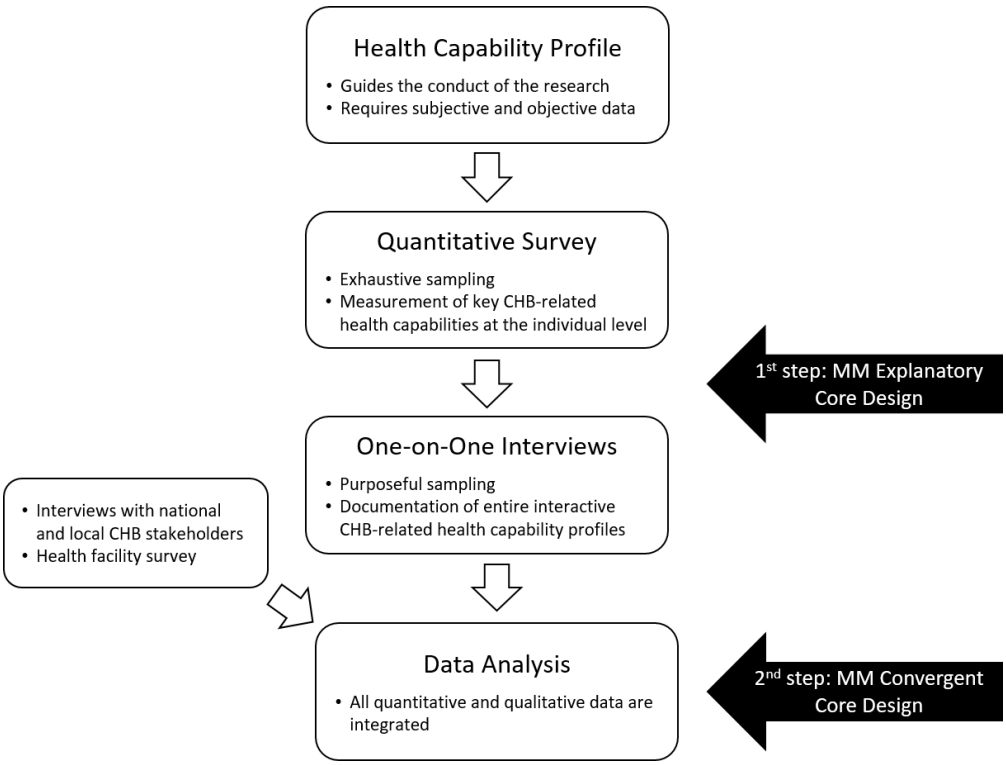

Figure 1: Sequential social justice mixed methods (MM) study design

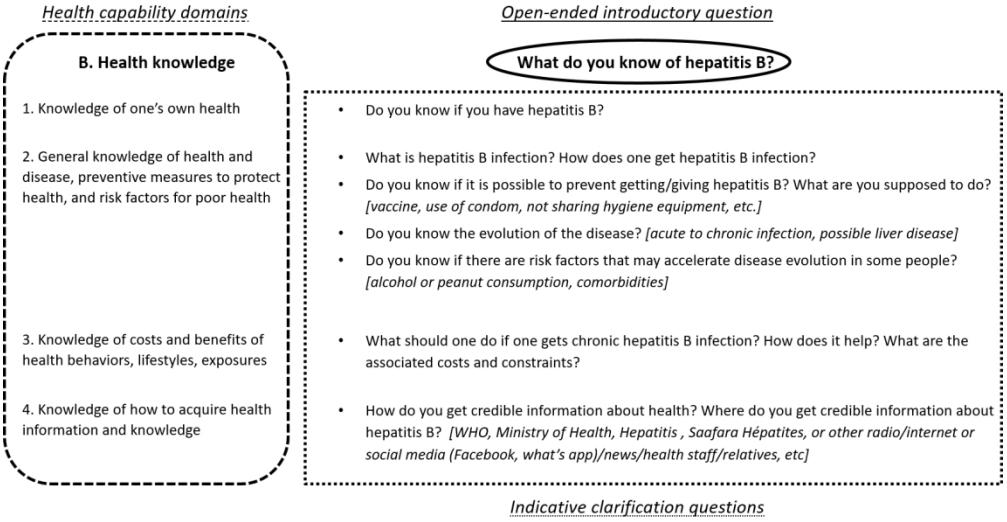

Figure 2: Illustration of the English version of the full interview guide using the internal health capability n°2, health knowledge

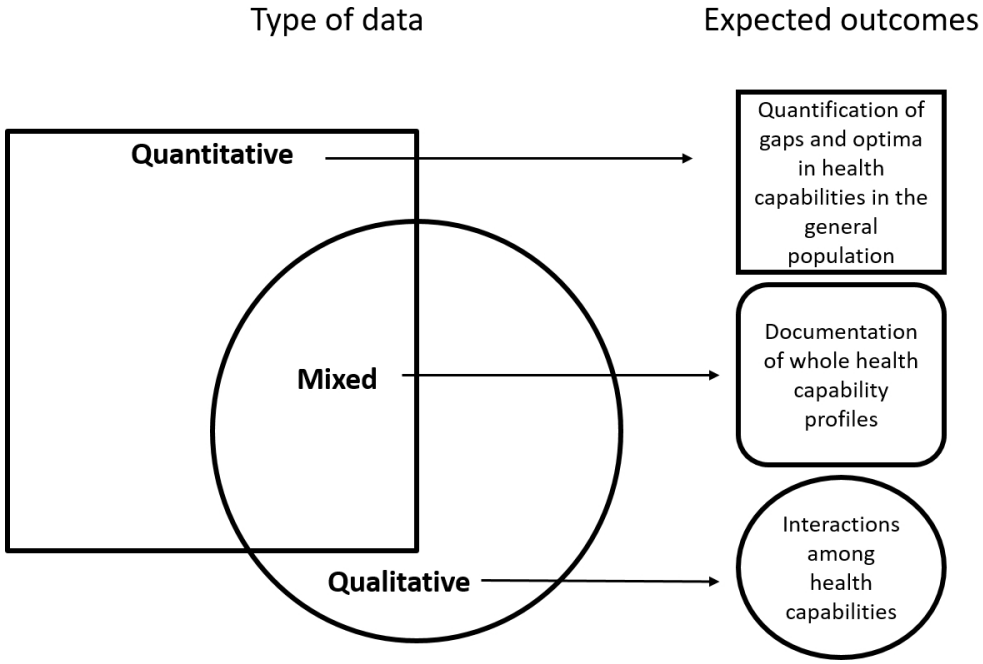

Figure 3: Illustration of the synergistic approach: type of data and expected study outcomes

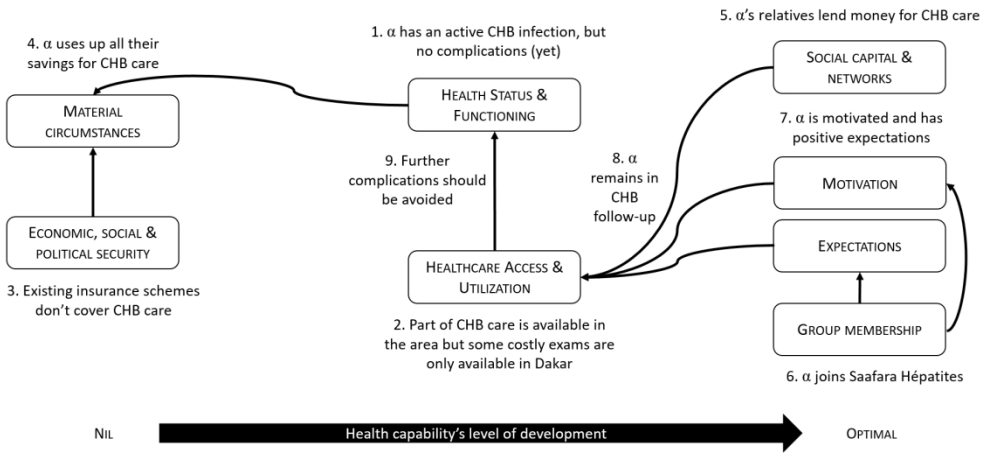

Figure 4: Flow diagram of α's hypothetical case

Upon participating to the AmBASS study, α was tested positive for CHB, and the exams showed that the infection is active (1). International and national CHB care guidelines recommend a bi-annual follow-up, including a consultation at the local dispensary as well as a viral load and Fibroscan imagery, which are only available in Dakar, and at a non-negligible cost (2). α's community-based health insurance doesn't cover any of these costs (3). α uses all the household's savings (4), and further borrows from relatives (5). α also joined the Saafara Hépatites patients' association, which helps α remain motivated, and have positive expectations (7). α manages to be followed up for CHB care (8), which should help prevent further complications (9).

Abbreviations:
CHB: chronic hepatitis B

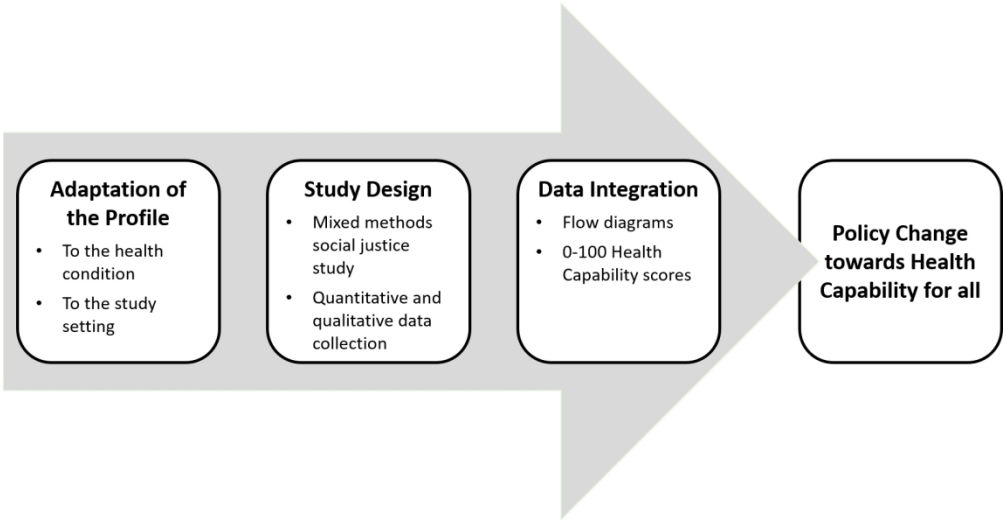

Figure 5: Applying the health capability profile

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Applying the Health Capability Profile to empirically study chronic hepatitis B in rural Senegal: a social justice mixed-methods study protocol

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Applying the Health Capability Profile to empirically study chronic hepatitis B in rural Senegal: a social justice mixed-methods study protocol

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Abstract

Introduction

Despite the early implementation of hepatitis B vaccination and the on-going decentralization of chronic hepatitis B (CHB) care, over 10% of the Senegalese adult population lives with CHB and liver cancer remains a main cause of death. Investigating factors associated with CHB infection, prevention of CHB-related morbidity, and prevention and treatment of mortality secondary to CHB calls for a holistic and multidimensional approach. This paper presents the adaptation of the health capability profile (HCP) to a specific epidemiological issue and empirical setting: it seeks to identify and analyze interrelated abilities and conditions (health capabilities) in relation to the CHB epidemic in the rural area of Niakhar, Senegal.

Methods and Analysis:

This ongoing study relies on a sequential social justice mixed-methods design. The HCP is comprehensively adapted to CHB in rural Senegal and guides the design and conduct of the study. Objective and subjective data are collected at the individual level following a mixed methods explanatory core design. The quantitative module, embedded in the ANRS12356 AmBASS cross-sectional survey (exhaustive sampling), is used to select a purposeful sampling of participants invited for one-on-one qualitative interviews. Additional data is collected at the institutional and community level through health facility surveys and an ethnography (in-depth interviews) of local and national CHB stakeholders. Data analysis adopts a synergistic approach to produce a multilayered analysis of individual health capability profiles and crosscutting analysis of the fifteen health capabilities. The data integration strategy relies on a mixed methods convergent core design, and will use 0-100 health capability scores as well as flow diagrams to measure and characterize levels of development and interactions among health capabilities respectively.

Ethics and dissemination:

This study was approved by Senegalese and French authorities. Results dissemination through local workshops and scientific publications aim at fueling effective policy change towards CHB-related health capability.

Keywords: health capability model; health capability profile; social justice mixed-methods study; chronic hepatitis B; Senegal; rural.

Article summary

Strengths and limitations of this study

- This is the first social justice mixed-methods study to adapt the entire health capability profile (conceptual framework) in Senegal and for chronic hepatitis B (CHB).
- This study will provide a comprehensive overview of cumulative abilities and conditions that are relevant to CHB-related morbidity and mortality in rural Senegal, and help illuminate processes for achieving optimal health capability.
- As an empirical investigation, this study has the potential to serves as a model for future adaptations of the health capability profile to different health issues and empirical settings using the indicative scoring table and dynamic flow diagrams presented in this paper.
- The main limitation of the study is one of external validity as results will be specific to CHB in the rural area of Niakhar in Senegal.

Introduction

Chronic hepatitis B (CHB) virus infection: a "silent epidemic" and global public health issue

With over 800,000 annual deaths worldwide attributed to cirrhosis and liver cancer secondary to chronic hepatitis B (CHB) according to 2017 WHO estimates[1], CHB has been referred to as "the silent epidemic" whose burden is comparable to those of HIV, tuberculosis or malaria[2]. In 2016, the WHO General Assembly committed to viral hepatitis elimination by 2030 with a three pillars strategy: prevention, testing, and treatment. Primary prevention of CHB infection relies on vaccination with an efficient vaccine available since the 1990s. The vaccine is usually administered in a three doses schedule – including a birth dose in some endemic areas, and has been found to be cost-effective, including in low-and-middle income countries[3]. The second pillar, testing, is key to identify people who are CHB patients since CHB infection is often asymptomatic in its early stages[4]. Third, life-long monitoring is essential to know when, if ever, life-long anti-viral therapies should be prescribed to control virus replication, and avoid CHB-related complications, specifically liver damage, cirrhosis and even liver cancer[5, 6]. Halfway assessments of reaching the WHO targets of a 90% reduction in new cases and a 65% reduction in mortality by 2030 have called for global investments[7], regional strategies[8], and a focus on countries with the greatest burden[9].

CHB response in Senegal

CHB prevalence is the highest in the Western Pacific region (6.2%) and in Africa (6.1%)[1]. Senegal was the first country in the Sub-Saharan African region to set up a National Viral Hepatitis Program in 1998. In this country, an estimated 8 to 10% of the population currently lives with CHB[10]. Hepatitis B vaccination was introduced in the expanded program on immunization starting in 2004 through the three dose pentavalent vaccine, with the addition of an extra dose within 24 hours of birth since 2016. Non-institutional stakeholders include the "Saafara Hépatites" patients association and the gastroenterology and hepatology Senegalese society (SOSEGH) that gathers medical experts. Anti-viral therapies that can control viral replication (but do not cure from chronic infection) are offered at a

subsidized monthly price of 5,000 CFA (about 8 USD), and in 2018 the Ministry of Health together with the National Viral Hepatitis Program announced the decentralization of CHB care to regional hospitals and reference healthcare facilities at the district level [11].

Despite the country's early response, the mobilization of civil society, and the existence of both preventative and curative options, Senegal is one of the only African countries to have seen an increase in estimated CHB prevalence between the late 1950s and the early 2000s [12]. Nowadays, liver disease secondary to viral hepatitis remains one of the leading cause of cancer[13], particularly among adult Senegalese men and women who were born before the successful implementation of the vaccination program [14].

Standard approaches to CHB-related morbidity and mortality in Sub-Saharan Africa, and in Senegal

Most studies conducted in Sub-Saharan Africa have focused on the role of health services organization and delivery and identified long waiting times [15], delays in administration of the birth dose [16, 17], opportunistic rather than systematic vaccination [18], or insufficient screening [19] as major barriers to reaching the WHO target of CHB elimination by 2030 [8]. Individual factors associated with CHB infection in sub-Saharan Africa include demographic characteristics such as age, gender or education level [20–22], customs, specifically home delivery, scarifications/tattooing, circumcision or shared items[23, 24], and medical history of surgery, injectable medication, or family history of liver disease[25, 26].

In Senegal, previous studies have particularly highlighted limited hepatitis B-related knowledge, both among lay population [27] and healthcare workers, from nurses in local dispensaries [28] all the way to physicians working in Dakar hospitals [29]. Factors related to health services organization and delivery, such as the fact that CHB testing and bi-annual follow-up exams remain costly (up to 75 USD for the latter) and are rarely available at local healthcare facilities, have also been documented as potential obstacles to CHB prevention and linkage-to-care in Senegal [30].

Finally, societal factors such as stigma attached to CHB infection and discrimination of CHB patients have long been a blind spot of studies conducted in the African region [31]. To the best of our knowledge, it remains undocumented in Senegal despite recent evidence in Ghana[32, 33], Zambia [34], Uganda [35] or Cameroon [36].

The Health Capability Profile: a multi-dimensional and in-depth framework

Compartmentalizing these factors and focusing on individual or social indicators in an *ad hoc* and fragmented manner, fails to provide a full picture of what dynamically plays into people's ability to avoid CHB-related morbidity and mortality in their complex lived experiences. A thorough investigation requires a more comprehensive, multi-dimensional and in-depth framework, such as the health capability profile [37].

The health capability profile identifies eight individual abilities (internal health capabilities) and seven societal abilities or conditions (external health capabilities), that interact with each other and together create people's ability to effectively achieve optimal health given one's biological predispositions, one's cultural and socio-economic environment, and available healthcare services and public health infrastructure [37] (see Table 1).

Table 1. The Health Capability profile [37]. Each health capability comprises one or several (number in parenthesis) domains.

Health Capabilities	
Internal	*External*
• Health status and health functioning (2) • Health knowledge (4) • Health-seeking skills and beliefs, self-efficacy (3) • Health values and goals (4) • Self-governance and self-management and perceived self-governance and management to achieve health outcomes (5) • Effective health decision-making (4) • Intrinsic motivation • Positive expectations	• Social norms (6) • Social networks and social capital for achieving positive health outcomes (3) • Group membership influences • Material circumstances (6) • Economic, political, and social security • Utilization and access to health services (5) • Enabling public health and health care systems (3)

The health capability profile generates an understanding of the integrative and multi-dimensional experience for individual health conditions, risk factors and health-related behaviors, the individual abilities of self-efficacy, perception, knowledge or motivation, and societal conditions – including, but not limited to, social norms, social networks, and material circumstances.

The health capability profile recognizes important advances of the biomedical model of disease [38], health belief models [39, 40] and social determinants of health [41–44]. However, compared with these alternative frameworks, the health capability profile builds on the basic idea that manifestations of diseases are the result of cumulative interactions of various capabilities. The profile is a dynamic framework that examines the combination, interrelatedness and interdependence of internal (individual) and external (societal and environmental) health capabilities in relation to risk of diseases, and resilience towards health and wellness.

Another attractive feature of the health capability profile is that it focuses on the identification of gaps between observed health capabilities, and an optimal level of health capability. It therefore contributes to the emerging field of implementation science [45–47], which seeks to ensure that evidence-based research (here, optimal health capabilities) translate into practice (observed health capabilities).

Last, but not least, the health capability profile contains a normative dimension. Drawing from the concept of human flourishing , the health capability paradigm reasons that individuals and societies work together towards the reduction of escapable morbidity and premature mortality – central health capabilities[48]. It advances normative principles on how to intervene to improve individual health capability profiles – tracking this overtime with the aim of moving from risk to resilience, individual and collective [48]. The health capability profile can hence provide powerful guidance for health policy design and evaluation.

Objectives

The overall objective of this study is to study CHB-related morbidity and mortality in rural Senegal using the health capability profile.

Secondary objectives

The secondary objectives are twofold. First, there is a methodological aspect, which is to adapt the health capability profile in order to investigate a contextualized public health issue, specifically CHB in rural Senegal.

Secondary objectives are also of an empirical nature:

(1) To quantify and characterize gaps between observed and optimal health capabilities relevant to CHB in rural Senegal, and document interactions among these health capabilities.

(2) To distinguish strengths and vulnerabilities that are peculiar to CHB patients, in particular in relation to entry into, and retention in CHB care. This includes an anthropological perspective to account for cultural and social aspects that are at play in rural Senegal.

(3) To identify marginalized CHB-related health capabilities (at the community level) and marginalized individual health capability profiles, and investigate positive examples of advanced levels of development of CHB-related health capabilities.

(4) To draw from the profile to help inform and prioritize short and long term policy change towards the elimination of CHB-related morbidity and mortality, or in other words, towards CHB-related Health Capability for all people living in rural Senegal.

Methods/Design

Study Setting

The study takes place in the Niakhar Health and Demographic Survey System [49] (HDSS), in Senegal, a rural area located 135km east of the capital, Dakar. The HDSS covers 30 villages, home of over 45,000 inhabitants (2018 census), which has been under demographic surveillance since 1962. Mortality tables and immunization records are available for all residents. The Niakhar HDSS, situated in the middle of the Fatick region, has a long history with the Senegalese hepatitis B response. Between 1978 and 1981, the area hosted one of the first hepatitis B vaccine trials conducted in Africa [50], and in July 2018, the Fatick region was appointed a pilot region for the decentralization of CHB care by the Senegalese National Viral Hepatitis Program [11]. More recently, the ANRS 12356 AmBASS survey on the burden of CHB took place between October 2018 and July 2019 in the Niakhar HDSS. Three hundred households were randomly selected, and all residents over 6 months of age were invited to participate to hepatitis B home testing, and to be interviewed using standardized face-to-face questionnaires [51]. In a second step, participants who tested positive to CHB undertook further exams to assess the stage of their disease, and treatment was provided to those eligible. In total 3,118 participants representative of the Niakhar HDSS population were recruited, among which 1,505 were born before September 2003 (hereafter adults), and 206 tested positive for CHB (a 7.1% CHB prevalence in the general population; 12.6% in the adult population)[52].

Adaptation of the conceptual framework

The Health Capability Profile's general framework was comprehensively adapted to the context of the empirical study, specifically CHB in rural Senegal (see Table 2). First, the profile focuses on information relevant to CHB infection in the Niakhar area including hepatitis B transmission routes –blood and sexual fluids –, the natural history of the disease as well as risk factors and behaviors, in particular alcohol use, a main factor associated with liver fibrosis in Western Africa [53] as is peanut consumption [54], the Niakhar area's main cash crop. Prevention of CHB-related morbidity and mortality is also at

the heart of the adapted profile through a focus on knowledge on, access to, and utilization of hepatitis B testing and vaccination, CHB care and anti-viral treatment options.

Second, the profile expresses elements of rural Senegal and the Niakhar HDSS, such as social norms in relation to the cultural and religious beliefs of the population of Serer ethnic group and majority Muslim [49] or the importance of traditional medicine [27]. Similarly, social capital and networks emphasize informal neighborhood groups, extended households, weekly markets, going to the mosque and membership in football teams, whereas material circumstances account for the area's hot weather, unpaved roads, informal work, and seasonal work migration[55]. In particular, the profile will capture the impact of geographic mobility (in terms of knowledge, economic capacity, etc.), and its relationship with the socio-cultural construction of the etiology of hepatitis B as well as with possible treatment routes (in Niakhar and elsewhere).

Additionally, the profile appeals to all stakeholders involved in CHB care and policy in Senegal, both the national level (such as the Viral Hepatitis Program, the Ministry of Health, the Society of Senegalese Hepatologists and Gastroenterologists, the Saafara Hépatites Patients Association, etc.), and at the local level – specifically community-based healthcare workers (*bajenu gox*), healthcare providers, and the center of traditional healers.

Table 2. Adaptation of the Health Capability Profile to CHB in Rural Senegal

Health status and health functioning
1. Self-reported health status
2. Health conditions: CHB-related health conditions (CHB status, and disease evolution if applicable; hepatitis B vaccination status; risk factors, including alcohol use, etc.) and other health conditions
Health knowledge
3. Knowledge on one's own hepatitis B and vaccination status
4. Knowledge on hepatitis B transmission routes, disease evolution, vaccination, testing, and treatment
5. Knowledge on behaviors that are CHB risk factors (alcohol use, nutrition, obesity)
6. Modes of health and CHB information gathering: health care providers, Internet, newspapers, radio, patients' associations, traditional healers, etc.
Health seeking skills and beliefs, self-efficacy
1. Belief in one's ability to avoid hepatitis B infection, or transmission and CHB-related complications
2. Ability to acquire CHB-related skills, and apply them: learning to monitor CHB condition and avoid infection or transmission (vaccine, hygiene, etc.)
3. Confidence in ability to perform or abstain from CHB-related health behaviors such as avoiding alcohol use, adapting diet, etc.
Health value and goals
1. Valuing one's health in general
2. Valuing the prevention of hepatitis B infection and transmission or CHB-related complications
3. Valuing CHB-related lifestyle or behaviors: change in diet (including alcohol use), hygiene, etc.
4. Recognizing and countering social norms detrimental to CHB prevention and monitoring
Self-governance and self-management and perceived self-governance and management to achieve health outcomes
1. Ability to be in control of one's life, to set and reach objectives in general
2. Ability to handle one's workload within the extended household [children, household work, farming, etc.] and outside [job or studies, etc.]
3. Ability to control one's behaviors for health or CHB-related purposes e.g., avoiding peanuts-rich family meals, or situations that involve alcohol
4. Ability to seek out support (help from family, neighbors) and obtain resources (transportation, financial means, etc.) to access CHB-related care
Effective health decision-making
1. Ability to use CHB-related knowledge and available resources to avoid infection, transmission or disease evolution
2. Ability to weigh the short- and long-term costs and benefits of CHB-related behaviors and actions, including alcohol use
3. Ability to identify CHB-related symptoms (in particular jaundice) and pursue vaccination, testing, follow-up and/or treatment.
4. Ability to make healthy choices in relation to CHB: reducing alcohol consumption, not sharing hygiene equipment, etc.
Intrinsic motivation to achieve desirable health outcomes
Quantifying motivation to avoid hepatitis B infection, transmission or CHB-related complications, and exploring whether it is internally (personal assessment) or externally (e.g., pressure from relatives or healthcare providers) motivated.
Positive expectations about achieving health outcomes
Optimistic or pessimistic viewpoint on personal life and CHB-related health prospects (avoiding infection, transmission and/or complications).
Social norms

1. Social norms on hepatitis B in relation to national and international recommendations 2. Favorable or unfavorable views on hepatitis B vaccination, on people living with CHB, alcohol use, and condom use 3. Quantification and characterization of people that undertake CHB vaccination and testing or adapt diet (including reducing alcohol consumption) 4. Discrimination or anti-discrimination of people living with CHB and of people seeking to access prevention or care (e.g. people with alcohol use disorder) 5. Norms on decisional latitude or power in relation to health in general, and CHB in particular 6. Changes, and resistance to social norms relevant to CHB (e.g., vaccination, alcohol use, healthcare access)
Social network and social capital 1. Ability to ask for instrumental help (e.g. delegating tasks for CHB care purposes), and ability to talk about one's problems including CHB status 2. Existence of patients' association, or other groups/networks that can support and provide information to people in relation to CHB 3. Existence of social networks or groups of people that have a detrimental impact in relation to CHB (discriminatory practices, false information, etc.)
Group membership influences Membership to any kind of community organization (union or political party, sports team, association, informal), or informal group that may provide instrumental or emotional support, or counterbalance/augment social norms relevant to CHB.
Material circumstances 1. Economic activity (formal or informal, part or full-time), and monetary resources 2. Neighborhood's quality of life and resources including access to healthcare facilities 3. Water source, waste management and latrines system 4. Housing status and quality (in particular crowding and heat protection) 5. Availability and quality of food (specifically dependency on peanuts) 6. Other CHB patients and other sources of pollution or disease in the immediate environment (soil, air, malaria…)
Economic, political, and social security 1. Economic security: availability, quality and security of jobs (temporary vs. permanent, wage, unemployment protection and insurance, sick leaves) 2. Political security: existence of institutions (including the judiciary) and elected representatives that represent the people's interests, and prevent violence and criminal activity 3. Social security: existence and quality of financial, old age, or disability protection schemes (e.g., pensions, access to bank accounts)
Utilization and access to health services 1. Symptoms of CHB-related health issue (jaundice, advanced liver disease) 2. Other serious or morbid symptoms of poor health 3. Perception of a need to see a healthcare provider (vs. traditional medicine or none) 4. Existence of CHB-related health services: availability of vaccination, testing, CHB follow-up exams and consultation 5. Barriers to access: geographic accessibility, waiting times, costs, etc.
Enabling public health and healthcare systems Extent to which healthcare facilities and health authorities (ministry representatives, health care professionals and facilties) are doing the following: 1. Giving information and helping people take charge of CHB prevention and monitoring 2. Helping protect people from CHB infection, transmission and complications 3. Being efficient in providing CHB-related care, and being accountable if not

Study Design

This ongoing study follows a sequential social justice mixed methods design (see Figure 1) in that the Health Capability Profile guides the design and conduct of the research [56, 57]. A full understanding of the various health capabilities and the overall health capability of a person requires data on objective abilities and situations (e.g., CHB status, CHB knowledge, economic circumstances, etc.), as well as information on subjective experiences (including, but not limited to, perceived competency, motivation, expectations, group membership influences, perception of a need to seek health services etc.). The need for objective and subjective quantitative and qualitative data from the individual and institutional and community perspectives necessitates a mixed methods design that combines quantitative and qualitative data collection.

The first step of the study relies on an explanatory core design [57, 58] with individual level quantitative data collection followed by qualitative data collection in the form of individual interviews. The quantitative survey provides an overview of gaps and optima in health capabilities associated CHB-morbidity and mortality in the study area (objective data) and is used for the purposeful sampling of participants invited for qualitative interviews. The subsequent qualitative data collection (essentially from an anthropological perspective) helps refine and complete these results with in-depth, dynamic, and comprehensive health capability profiles, including information on personal experiences (subjective data) as well as interactions between health capabilities at the individual level, both of which cannot be properly documented with standardized questionnaires. In contrast, in-depth one-on-one interviews are particularly appropriate to gather perceptions and representations of CHB-related health behaviors, beliefs and obstacles to entry into care.

In addition, all stakeholders and elements of the Profile need to be accounted for. This includes individuals, healthcare system and healthcare professionals, institutional representatives, patients' advocates, etc. We therefore complement individual level data collection with institutional and community-based data collection through a health facility survey of CHB resources in the healthcare system and in-depth interviews with national and local CHB stakeholders. Whenever possible, these

interviews take place as focus groups in order to confront point of views and thereby identify convergence and divergence on health capability development, in particular among representative of local healthcare workers or community leaders. It is likely that national stakeholders will be involved through one-to-one interviews, which are more flexible in terms of accommodating busy schedules.

In a second step, information from interviews (qualitative data) and from individual and health facility surveys (quantitative data) are all integrated following a mixed methods convergent core design [57].

[INSERT FIGURE 1 HERE]

The quantitative survey took place between January and July 2019. The subsequent conduct of the one-on-one interviews, focus groups and health facility survey was significantly delayed by the COVID-19 epidemics; it eventually started in July 2021 and is expected to be completed by the end of March 2022.

Quantitative survey

A specific module was designed based on the health capability profile, in conjunction with a review of empirical studies, to identify items that could document health capability domains given the study area and participants. Health status and health functioning is assessed using self-reported health (SF12v2 health survey [59]), CHB status and BMI in all participants; in addition a clinical and biological check-up (to identify liver disease stage) and CHB-risk factors are explored for participants who tested positive for CHB. Health-related knowledge is documented through general knowledge on CHB including transmission routes, clinical complications, hepatitis B vaccine and knowledge of hepatitis B testing. Health seeking skills and beliefs, and self-efficacy are measured with questions on perceived health competency [60]. Self-governance and self-management and perceived self-governance and management to achieve health outcomes is evaluated through a 10 step hypothetical ladder measuring individual-level perception of empowerment[61]. Intrinsic motivation to achieve desirable health outcomes is assessed using an adaptation of the relative autonomy index [62] and social norms are measured at the individual level through last say type of questions on individual decisional latitude [63]. Data on material circumstances include the household's economic status and monetary

resources, type of neighborhood, water access, housing and living conditions, food security, and the CHB status of the other household members. Finally, access and utilization of health services is documented using symptoms of poor health, healthcare utilization, and obstacles to healthcare seeking [64]. The quantitative health capability module was embedded in the demographic and socio-economic quantitative data collection of the 12356 ANRS AmBASS survey [51](see the survey in the Appendix) and administered to all 725 adult participants included after January 2019. This sample allows for a 3% margin of error with a 95% confidence level, given an upper limit of a 15% prevalence of CHB patients among the 25,000 inhabitants over 15 years of age in the Niakhar area (533 individuals required). Trained interviewers recorded answers using tablets equipped with the VoxCo software.

One-on-one interviews

All health capabilities of the profile were clarified, expressed in the context of rural Senegal, translated into French (official language of Senegal), and reworded as an open-ended question that is accessible and meaningful to all study participants in order to build the interview guide. For example, the internal factor's dimension on enabling healthcare and public health systems will be investigated through the question, "What is your perception on the work the healthcare facilities and health authorities (ministry representatives, physicians, dispensaries, health center, regional hospital and hospitals in Dakar) are doing in helping you taking care of your health, including when it comes to hepatitis B?". The interview guide also includes an extensive list of clarification questions meant to guide interviewers in covering all 49 domains comprised in the profile (see Figure 2 for an example, and the Appendix for the whole discussion guide).

[INSERT FIGURE 2 HERE]

The preliminary interview guide was discussed, clarified and translated in Wolof and Serer during pilot interviews conducted with the participation of members of the Safaraa hepatitis patients' association. One-on-one semi-structured interviews are recorded and conducted in Serer (local language of the main ethnic group), Wolof (spoken by a majority of the Senegalese population) or French according to

the participant's own preference. Recordings are erased after transliteration, and translation – for interviews conducted in Wolof and Serer – by the research team.

The selection of the AmBASS survey participants invited for a one-on-one semi-structured interview follows a purposeful sampling strategy, first, in order to interview individuals that represent the population's diversity in terms of age, gender, education level, occupation, CHB status, and healthcare utilization, and second, to represent the population's diversity in terms of CHB-health capability profile and health capability capital. Participants are contacted for interviews using these criteria, until data saturation is reached – it is expected to happen at around 35 to 40 in-depth individual interviews (IDI) [65].

Interviews with local CHB stakeholders

Additional interviews are conducted with healthcare staff involved with hepatitis B prevention or care for patients living in the Niakhar area, community health counselors (*bajenu gox*) of the Niakhar area, members of the Saafara hepatitis patients' association, and institutional stakeholders involved in CHB policy (Viral Hepatitis Program, Ministry of Health, etc.) to complement information on CHB-related external health capabilities. More specifically, these interviews are used to collect objective, community level data on CHB-related social and cultural norms, social networks and group membership influences, the political, economic and social security and the availability, safety, efficiency and accountability of health services, and of the overall healthcare system (including health and cultural beliefs and behaviors). These additional interviews are on going and will be conducted until all types of stakeholders are represented, and after data saturation has been reached – which should happen at around 2 to 3 focus groups or 10 to 15 one-on-one key-informant interviews (KII). The discussion guide is presented in the Appendix.

Health facilities survey

The survey makes an inventory of resources available in all the health facilities involved with CHB patients living in the Niakhar area: the public dispensaries of Diohine, Ngayokheme, and Toucar, the

Diohine private dispensary, the Niakhar and Fatick health centers, the Fatick regional hospital, and the Dakar reference hospitals for advanced liver disease secondary to CHB (exhaustive sampling). The survey draws from a micro-costing methodology to document the availability and use of resources mobilized or mobilizable for CHB care, specifically human resources (headcount, general as well as specific CHB training, workload and salary base of physicians, healthcare workers, and administrative staff), equipment and facilities, medical imaging, biological exams (laboratory facility, staff, and machinery), and medication. The health facility questionnaire is presented in the Appendix.

Data Analysis Plan and Data Integration Strategy

A multi-layered, synergistic data analysis plan

The data analysis plan is multilayered. The first layer is the individual level through the documentation of individual health capability profiles. The second layer of analysis will consist in a crosscutting analysis of each of the fifteen health capabilities conducted at the level of the Niakhar area. The data analysis plan also draws from a synergistic approach [66] in adopting a position of equal value of qualitative and quantitative data, and aiming at producing robust qualitative, quantitative and mixed methods results (see Figure 3).

[INSERT FIGURE 3 HERE]

First, we will use data from the quantitative survey to produce descriptive statistics for each of the health capability domains that are documented in the survey (health status, knowledge, perceived competency, intrinsic motivation, social norms on decisional latitudes, material conditions, health care access and utilization either complete (participants to the quantitative survey and one-on-one interviews). Outcomes of the quantitative data analysis are the identification and quantification of gaps (e.g., low hepatitis B knowledge) or optima (e.g., high self-reported health) in those key health capabilities in the general population of the Niakhar HDSS.

Second, the qualitative data analysis will rely on deductive content analysis using the fifteen health capabilities and their domains as a coding matrix to analyze the transcription of the interviews and focus groups [65, 67]. Qualitative data will reveal interactions among health capabilities, as well as

community-level health capabilities' dynamics and levels of development. This analysis will include the additional information from interviews with national and local CHB stakeholders as well as objective data from the health facility survey.

Finally, quantitative and qualitative data will follow a process of data integration to produce a mixed methods analysis of whole health capability profiles at the individual level in participants to both the quantitative survey and one-on-one interviews. The data integration strategy will rely on the use of health capability scores and flow diagrams; both these tools were developed as part of this study.

Health capability scores

First, individual-level qualitative and quantitative data will be combined to yield a 0-100 score for each of the 15 health capabilities. Some quantitative data such as Likert-scale type numeric variables can be directly turned into such a score. Other data will be transformed using an indicative scoring table (see Table 3) developed from the Dreyfus model of skill acquisition and its adaptation to clinical competence [68], and the community readiness model [69]. The 100 maximum score, or optimal level, corresponds to a normative but realistic and attainable goal that accounts for the context, both at the macro and individual levels. For internal capabilities, optimality corresponds to the level of expertise that can be attained by a layperson, for instance in individuals involved in delivering expert patient programs [70–72].

Table 3. Indicative health capability development scoring table

Score	Stage of capability development	Internal capability "The individual is…"	External capability "The conditions are…"
0	Absence/Nil	Naive	Unpropitious
10	Basic 1	Novice	Non-hindering
25	Basic 2	Advance beginner	Promising
40	Intermediate 1	Autonomous	Propitious
55	Intermediate 2	Competent	Favorable
70	Advanced 1	Experienced	Facilitating
85	Advanced 2	Proficient	Enabling
100	Optimal	Expert	Fully enabling

Two team members trained to the health capability profile will independently score profiles, with a third member solicited for scores diverging by more than 15 (i.e., a whole stage of development). Scores will be employing the whole 0-100 range [1].

Health capability scores will then be aggregated across individuals for each of the fifteen health capabilities in order to document areas of shared strengths or vulnerability that can help inform and prioritize policy. Scores will be also be aggregated at the individual level to quantify overall level of health capability development (overall health capability set), which should allow for the identification and characterization of profiles at each end of the health capability set (i.e., strong versus vulnerable profiles). Strong profiles will be used to comprehend the dynamics behind positive examples of advanced levels of development of CHB-related health capabilities, whereas marginalized health capability domains or profiles shall help guide policy change towards the greatest needs. However, these aggregated scores complement, but do not replace, the detailed analysis of health capabilities: the profile as a whole is what creates Health Capability.

Dynamic flow diagrams

Flow diagrams will also be used to integrate quantitative and qualitative data at the individual level (see a hypothetical example in Figure 4)**.**

[INSERT FIGURE 4 HERE]

These diagrams help place the most relevant health capabilities on a nil to optimal development continuum, and reveal interactions between health capabilities, including cumulative building (e.g., virtuous circles or vicious circles).

Patient and public involvement

[1] For example, the four questions on self-perceived competency with a 5-point Likert Scale will be aggregated employing a new scale of value 0 (fully disagree)/5(disagree)/10(neither agree nor disagree)/20(agree)/25(fully agree) allowing for all levels of developments ranging from someone fully disagreeing will all four items (score 0) to someone fully agreeing with them –scoring 100, an optimal but attainable level of perceived competency.

CHB patients were represented through the Saafara Hepatitis patients' association, which participated in the study design workshop and data collection training session. CHB patients, the Saafara Hepatitis patients' association, healthcare professionals, SOSEGH members and institutional stakeholders are all involved in the study through group or one-on-one interviews. They will also be invited to result dissemination workshops organized at the local (Niakhar area) regional and national levels.

Ethics and dissemination

Ethical considerations

This research respects the ethical principles advanced by the current version of the Helsinki Declaration, as well as regulations defined by legal and institutions bodies supervising research involving humans, and collection of personal data both in Senegal and in France – including the European Union General Data Protection Regulation. The study received ethical approval from the Senegalese National Ethical Committee for Research in Health (CNERS) no. 082MSAS/DPRS/CNERS on 10 April 2018, last renewed in July 2021, administrative authorisation from the Ministry of Health and Social Action and authorisation from the French Commission on Information Technology and Liberties (CNIL) reference MMS/HG/OTB/AR181521.

Information, consent and data confidentiality

All participants were explained the design and objectives of the study and signed two copies of the informed consent form before the start of the quantitative data collection. The procedure and objectives of the qualitative data collection are also presented to participants invited for semi-directed interviews who will sign two copies of a separate inform consent form. Participants are identified using a unique, study-specific identification number (ID) that was entered in the electronic tablets during the face-to-face questionnaires (quantitative data collection). This study ID is also used to connect quantitative and qualitative data. Information that could identify participants or their relatives (such as individual names, addresses or neighborhoods) are removed during the transcription of one-on-one

interviews, and recordings are erased directly after transcription. The team members in charge of data analysis therefore only have access to pseudonymous data.

Expected benefits and risks for study participants

The main risk for participants in the AmBASS survey was to learn of one's CHB status; in contrast, they benefited from free CHB-related care, specifically testing, the initial clinical exam and biological check-up, consultation in reference facilities and provision of antiviral therapy until the end of the study funding (March 2022). The study also collaborated with the Sen-B research cohort at the Fann hospital in Dakar to offer participation for AmbASS active CHB patients, which comes with fully funded CHB care for the duration of the cohort. Participation in the qualitative data collection does not entail any risks, apart from the time dedicated to the interview. All participants will benefit from results dissemination, as well information and sensitization on prevention of CHB-related morbidity and mortality.

Expected results and dissemination plan

An empirical application of the health capability profile

Using a social justice mixed methods sequential design, this study adapts the health capability profile to empirically study CHB-related morbidity and mortality in rural Senegal. To our knowledge, this is the first time to collect in one study and for each individual both individual factors such as knowledge, perceived competency, and motivation as well as social (external) factors such as social norms, type of neighborhood, social networks or living conditions, all linked to health status and health outcomes in relation to CHB. In line with recent calls for dynamic and multidimensional approaches to social conditions and factors that influence people's health[73], the health capability profile will capture a broader, multidimensional and more accurate array of interrelated factors that puts individuals at risk or to be resilient for CHB and successful CHB prevention and/or management in rural Senegal.

The overlapping and interactive nature of the profile entails that a number of data/information will be analyzed in several health capabilities. For instance, an absence of health insurance will inform a

shortfall in overall social security as well as a potential obstacle to accessing health services. Similarly, CHB-related symptoms document both health status and functioning, and the perception of the need to see a health provider when experiencing a serious or morbid health symptom, which is part of utilization and access to healthcare services. To address potential concerns of duplicates at the health capability level, we primarily assign quantitative indicators to a preferred health capability (as showed in quantitative survey's structure presented in the Appendix), combine several quantitative indicators for each health capability, and integrate them with qualitative data to establish final scores. We would also control for collinearity if introducing several health capabilities scores in a regression (though it is not the focus of our analysis). Far from problematic, we believe that it is a strength of the profile to account for, and emphasize, the inter-relatedness among individual skills and features, and broader conditions.

In addition, the health capability profile relates to the concept of positive deviance, which has been used to highlight positive, intentional departure from standard medical practice [74], with recent applications to the prevention and control of infections [75] or to health equity issues [76] beyond the realm of healthcare and public health systems. The health capability profile allows for the identification of effective or positive examples in all domains that constitute a person's health capability (including in areas such as health-related knowledge, beliefs, motivation or expectations).

Furthermore, unlike perspectives that focus solely on individual abilities and characteristics, the profile brings out collective capabilities from a sociological and anthropological point of view. For instance, the profile will document the interplay between gender-specific decision-making latitude, financial agency, health care seeking expectations and behaviors, and geographic mobility relevant to women, or reveal interactions or health capability strengths and shortfalls that are at play in marginalized populations.

For these reasons, the health capability profile will help better illuminate the most important or most influential factors or interactions of factors in the system of health production or disease creation in relation to CHB for actionable recommendations in rural Senegal, and other relevant settings.

Finally, as an empirical investigation, our study serves as a model for future adaptations (see Figure 5). While the health capability profile has been applied in other settings and populations[77, 78], this is the first empirical mixed-methods study to adapt the entire health capability profile in Senegal and for CHB. Applications to different research questions, settings or populations, will be able to draw from our study design, data collection tools, synergistic approach to quantitative, qualitative, and mixed data analysis, and data integration strategy using capability scores and flow diagrams.

Our study presents a clear strategy for mixed methods data integration, with the use of individual flow diagrams and of a 0-100 score for each of the fifteen health capabilities derived from a detailed indicative scoring table. The provision of eight distinct levels of health capability development with corresponding descriptions for internal and external capabilities produces a refined model which should allow overcoming most of the challenges associated with data integration in mixed methods studies [79]. Our approach thereby contributes to the literature on data integration strategies[80] and provides a response to the lack of coherence which has been noted in a recent review of applications of the capability approach to the health field [81].

[INSERT FIGURE 5]

Results dissemination

Results dissemination workshops will be organized at the local (Niakhar area) regional and national levels. As per the social justice orientation of this study[56], results dissemination will aim at building on the study results to fuel discussions, actions plans and effective policy change towards HBV-related health capability for all. Results will also be disseminated through publications in scientific peer-reviewed journals, and presentations in international conferences on viral infections including hepatitis, public health, social sciences, etc.

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Author Contributions

JPR conceived the health capability profile and substantially contributed to the conceptualization and design in its adaptation to the context of CHB in rural Senegal in supervising MC. MAB & MM substantially contributed to the design of the qualitative data collection and analysis strategies with MC. SB and AD are the principal investigators of the ANRS 12356 AmBASS survey; they oversaw the quantitative data collection. MC designed the study with contributions from AD, SB and JPR, and MC drafted the manuscript with important intellectual content in revising it from AD, JPR, and SB. All authors read and approved the final manuscript and all authors agree to be accountable for all aspects of the work.

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Competing interests' statement

The authors declare that they have no competing interests.

Consent for publication

Not applicable

Availability of data and materials

The data generated by the study are available from France REcherche Nord&Sud Sida-hiv Hépatites (ANRS-Inserm) and Aix-Marseille University but restrictions apply to the availability of these data, due to privacy/ethical reasons. Data are however available from the authors upon reasonable request and with permission of the sponsors and ethical bodies (including the French Commission on Information Technology and Liberties).

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Figure legends/captions

Figure 1: Sequential social justice mixed methods (MM) study design

[INSERT FIGURE 1]

Abbreviations:

CHB: chronic hepatitis B

MM: mixed methods

Figure 2: Illustration of the English version of the full interview guide using the internal health capability n°2, health knowledge

[INSERT FIGURE 2]

Figure 3: Illustration of the synergistic approach: type of data and expected study outcomes

[INSERT FIGURE 3]

Figure 4: Flow diagram of α's hypothetical case

[INSERT FIGURE 4]

Upon participating to the AmBASS study, α was tested positive for CHB, and the exams showed that the infection is active (1). International and national CHB care guidelines recommend a bi-annual follow-up, including a consultation at the local dispensary as well as a viral load and Fibroscan imagery, which are only available in Dakar, and at a non-negligible cost (2). α's community-based health insurance doesn't cover any of these costs (3). α uses all the household's savings (4), and further borrows from relatives (5). α also joined the Saafara Hépatites patients' association, which helps α remain motivated, and have positive expectations (7). α manages to be followed up for CHB care (8), which should help prevent further complications (9).

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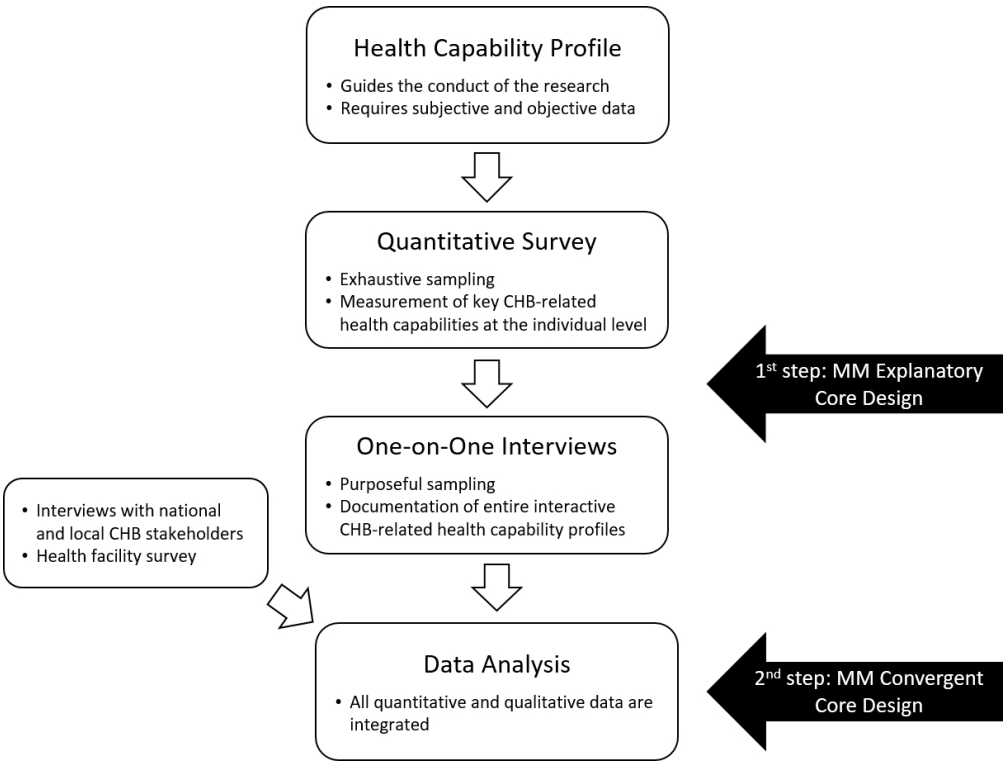
CHB: chronic hepatitis B

Figure 5: Applying the health capability profile

[INSERT FIGURE 5]



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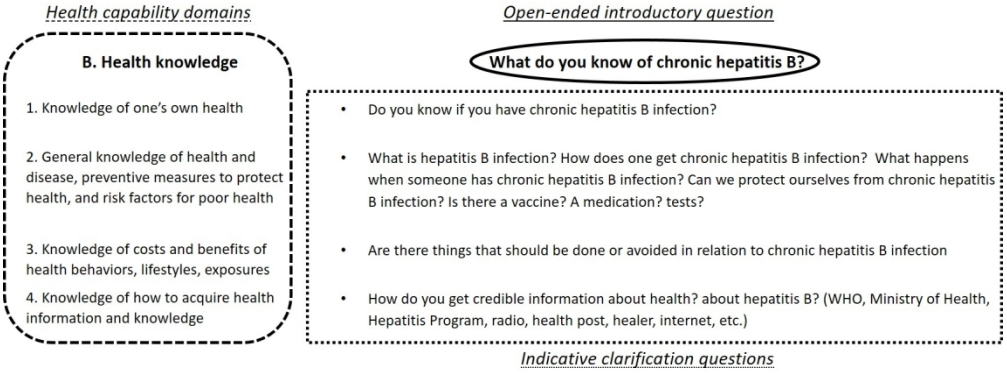

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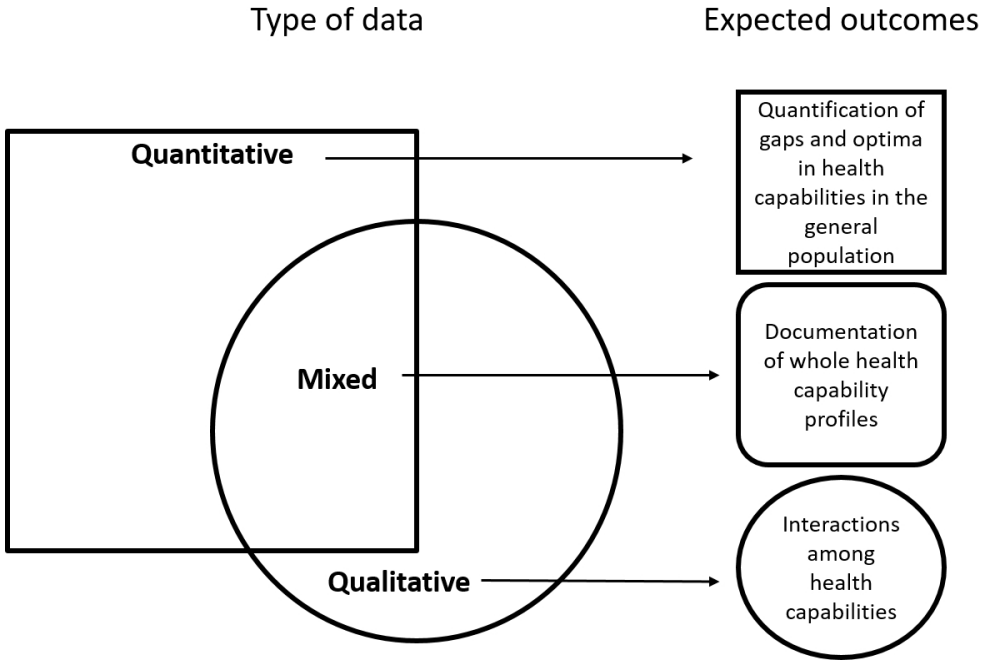
290x112mm (150 x 150 DPI)



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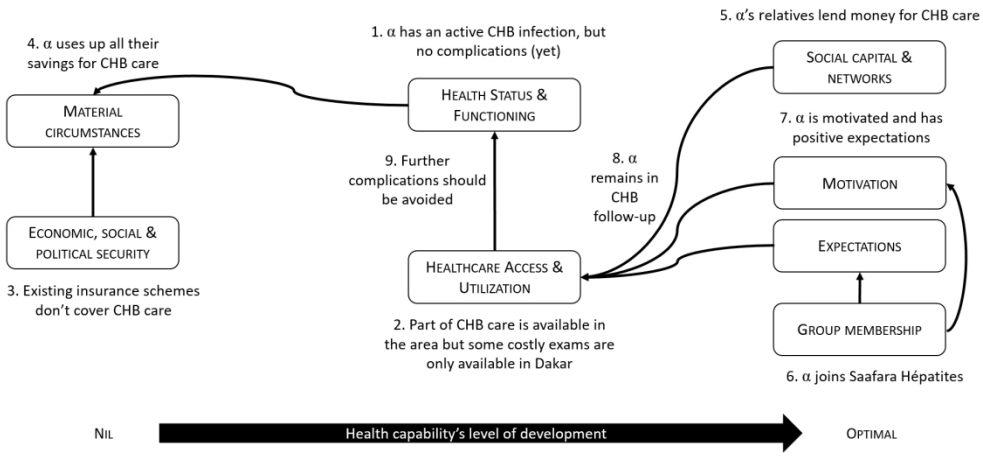

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CHB: chronic hepatitis B

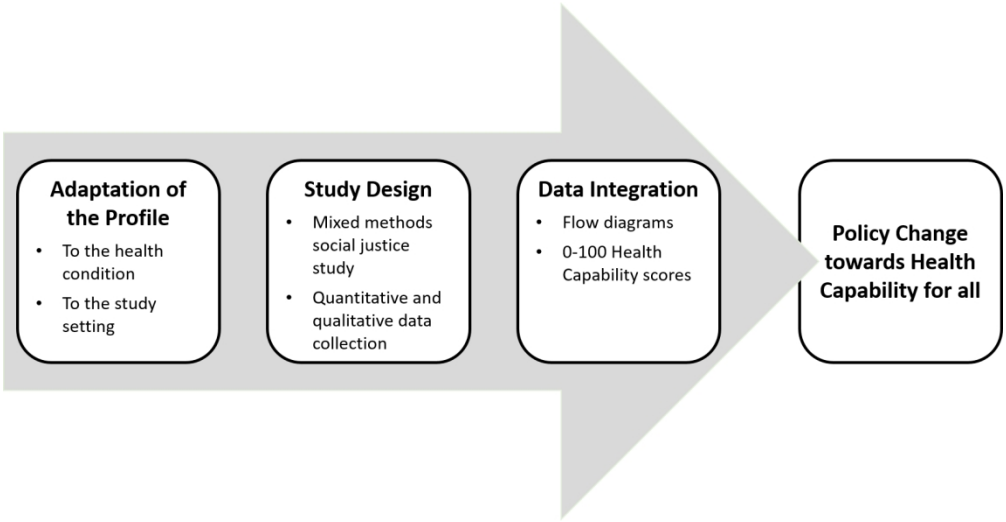

Figure 5: Applying the health capability profile

APPENDIX: DATA COLLECTION TOOLS

A. Quantitative survey

General information

VILL. Village name: _____
HAM. Hamlet name: _____
A0. Concession code: |__|__|__|
A1. Household code: |__|__|
ID. Individual ID: |__|__|__| |__||__| |__|

DVIS. Date of visit: |__| |__| |__|
Day Month Year
ENQ. Investigator: _____

Gender □ 1. Male □ 2. Female

Date of birth |__|__| |__|__| |__|__|__|__|
Day Month Year

What is your marital status?
□ 1. Married □ 2. Single □ 3. Widow(er) □ 4. Divorced

If you are married, are you in a union...
□ 1. Monogamous □ 2. Polygamous

How many children do you have? |__|__|
(Note 0 if the person has no children)

In the past 12 months, how much time did you spend in the household? |__ |__| month |__| days

Are you currently studying or training? □ 1. Yes □ 2. No

What education/training are you pursuing?
□ 1. Middle school □ 2. High School □ 3. Higher education (university)
□ 4. Professional training □ 5. Other => **Specify**: _____

Where are you undertaking this education/training?
□ 1. In the Fatick region **=> Do you go back to your household every night?** □ 1. Yes □ 2. No
□ 2. In Dakar □ 3. In another region of Senegal (outside of Dakar) □ 4. In another country

Health status and health functioning

SELF-REPORTED HEALTH

In the past 3 months, how would you rate the impact of your health on your ability to work?
Consider days when you were limited in the amount or type of work you could have done, such as if you had to work less time or could not work as well as usual.
□ 1. My health problems have had no effect on my work (or I have no health problems)
□ 2. Because of my health problems, I have had some difficulty working
□ 3. Because of my health problems, I had a lot of difficulty working
□ 4. Because of my health problems, I have not been able to work at all

In the past 3 months, how would you rate the impact of your health on your ability to perform your usual daily activities?
By usual daily activities, we mean activities that you do on a regular basis, such as housework, shopping, childcare, studying, etc. Consider days when you were limited in the amount or type of activity you could have done, for example if you did less than you would have liked.
□ 1. My health problems have had no effect on my daily activities (I have no health problems)
□ 2. Because of my health problems, I have had some difficulties in performing my daily activities
□ 3. Because of my health problems, I had a lot of difficulty performing my daily activities
□ 4. Because of my health problems, I have not been able to do my daily activities at all

SF12 SCALE (VERSION 2 ADAPTED)

Overall, do you think your health is:
□ 1. Excellent □ 2. Very good □ 3. Good □ 4. Fair □ 5. Poor

Here is a list of activities you may have to do in your daily life:
(For each of these, indicate whether you are bothered by your current health condition)
- Moderate physical effort such as moving a table, sweeping the floor, walking slowly for about 20 minutes on level ground
□ 1. Limited a lot □ 2. Limited a little □ 3. Not limited at all
- Climb several flights of stairs, walk up a steep hill for a few minutes, or walk quickly for 100 meters
□ 1. Limited a lot □ 2. Limited a little □ 3. Not limited at all

In the past 4 weeks, and due to your physical condition:
- Did you do less than you would have liked?
□ 1. All of the time □ 2. Most of the time □ 3. Some of the time
□ 4. A little of the time □ 5. None of the time
- Did you have to stop doing certain things?
□ 1. All of the time □ 2. Most of the time □ 3. Some of the time
□ 4. A little of the time □ 5. None of the time

In the past 4 weeks, and due to your emotional state (feeling sad, nervous or depressed):
- Did you do less than you would have liked?
□ 1. All of the time □ 2. Most of the time □ 3. Some of the time
□ 4. A little of the time □ 5. None of the time
- Did you find it difficult to do what you had to do with such care and attention?
□ 1. All of the time □ 2. Most of the time □ 3. Some of the time
□ 4. A little of the time □ 5. None of the time

In the past 4 weeks, how much have your physical aches and pains interfered with your work or home activities?

□ 1. Not at all □ 2. A little bit □ 3. Moderately □ 4. Quite a bit
□ 5. Extremely

In the past 4 weeks, have there been times when your health condition, either physical or emotional, has interfered with your life and your relationships with others, family, friends, acquaintances?
□ 1. All of the time □ 2. Most of the time □ 3. Some of the time
□ 4. A little of the time □ 5. None of the time

The following questions are about how you have felt over the past 4 weeks.
In the past 4 weeks, were there times when:
- You felt calm and relaxed
□ 1. All of the time □ 2. Most of the time □ 3. Some of the time
□ 4. A little of the time □ 5. None of the time
- You felt energized
□ 1. All of the time □ 2. Most of the time □ 3. Some of the time
□ 4. A little of the time □ 5. None of the time
- You felt sad and downcast
□ 1. All of the time □ 2. Most of the time □ 3. Some of the time
□ 4. A little of the time □ 5. None of the time

FATIGUE

Now I'm going to ask you to rate your current level of fatigue.
□ 1. I don't feel tired at all / I don't feel any fatigue □ 2. I feel a little tired
□ 3. I feel very tired □ 4. I am exhausted/I feel extremely tired

Approximately how long have you been feeling tired? |__|__| Days |__|__|Weeks |__|__| Month |__|__| Years

Are you bothered by the fatigue you feel at the moment when carrying out your daily activities or work?
❑1. Not at all: the fatigue I feel does not hinder me at all in my activities or my work
❑2. A little / sometimes: sometimes the fatigue I feel hinders me from carrying out my activities or my work
❑3. A lot / often: the fatigue I feel bothers me a lot / often
❑4. Because of the fatigue I feel, I am unable to perform my daily tasks or work

DISABILITY

Do you currently have a disability? □ 1. Yes □ 2. No

What is your disability?
□ 1. Alteration or loss of vision □ 2. Speech impairment
□ 3. Inability to walk or move (paralysis or amputation of a lower limb)
□ 4. Inability to use an upper limb (paralysis or amputation of an upper limb)
□ 5. Other => **Specifiy**: _____

ONLY FOR CHB PATIENTS – ADMINISTERED BY THE AMBASS STUDY PHYSICIAN

BODY-MASS INDEX & CURRENT HEALTH CONDITIONS

Weight: |__|__|__| kg

Height: |__| m |__|__| cm

Blood pressure: |__|__| |__|

Fever (over 38 degrees) □ 1. Yes => |__|__| degrees □ 2. No

Current chronic condition? □ 1. Yes □ 2. No

□ 1. Diabetes □ 2. AVC □ 3. Sickle cell disease □ 4. HTA

□ 5. Heart failure □ 6. Renal insufficiency □ 7. Other => **Specify** _____

Current acute condition?

□ 1. Yes => **Specify**: _____ □ 2. No

CHB-RELATED HISTORY & SYMPTOMS

CHB STATUS *(as a result of home-based testing using)*

□ 1. AgHBs+ (CHB patient) □ 2. AgHBs-

Have you been vaccinated against hepatitis B? □ 1. Yes □ 2. No

If yes: How many doses did you receive? |__|

Has anyone close to you ever had any of the following diseases?

Spouse

□ 1. Liver cirrhosis □ 2. Liver cancer ("big belly") □ 3. Viral hepatitis □ 4. Stroke

Father

□ 1. Liver cirrhosis □ 2. Liver cancer ("big belly") □ 3. Viral hepatitis □ 4. Stroke

Mother

□ 1. Liver cirrhosis □ 2. Liver cancer ("big belly") □ 3. Viral hepatitis □ 4. Stroke

Brothers/sisters

□ 1. Liver cirrhosis □ 2. Liver cancer ("big belly") □ 3. Viral hepatitis □ 4. Stroke

Father's parents

□ 1. Liver cirrhosis □ 2. Liver cancer ("big belly") □ 3. Viral hepatitis □ 4. Stroke

Mother's parents

□ 1. Liver cirrhosis □ 2. Liver cancer ("big belly") □ 3. Viral hepatitis □ 4. Stroke

Other family member => Specify: _____

□ 1. Liver cirrhosis □ 2. Liver cancer ("big belly") □ 3. Viral hepatitis □ 4. Stroke

CLINICAL EXAMINATION

Presumptive evidence of liver disease (current or past)

Digestive haemorrhages	□ 1. Yes => □ 1.Hematemesis □ 2. Melaena □ 3. Rectorrhagia		□ 2. No
Edema	□ 1. Yes, in the past	□ 2. Yes, on-going	□ 3. No, never
Ascites	□ 1. Yes, in the past	□ 2. Yes, on-going	□ 3. No, never
Icterus	□ 1. Yes, in the past	□ 2. Yes, on-going	□ 3. No, never
Cirrhosis	□ 1. Yes, in the past	□ 2. Yes, on-going	□ 3. No, never
Encephalopathy	□ 1. Yes, in the past	□ 2. Yes, on-going	□ 3. No, never

Presumptive evidence of extrahepatic disease (current or past)

Vacsulities	□ 1. Yes, in the past	□ 2. Yes, on-going	□ 3. No, never
Cryoglobulinemia	□ 1. Yes, in the past	□ 2. Yes, on-going	□ 3. No, never
Vascular purpura	□ 1. Yes, in the past	□ 2. Yes, on-going	□ 3. No, never
Arthromyalgia	□ 1. Yes, in the past	□ 2. Yes, on-going	□ 3. No, never
Kidney damage	□ 1. Yes, in the past	□ 2. Yes, on-going	□ 3. No, never
Livedo	□ 1. Yes, in the past	□ 2. Yes, on-going	□ 3. No, never
Mono-polyneuritis	□ 1. Yes, in the past	□ 2. Yes, on-going	□ 3. No, never

RISKS FACTORS FOR CHB EVOLUTION OR TRANSMISSION

- **ALCOHOL USE**

In the past 6 months, have you ever consumed alcohol?

□ 1. Never □ 2. Once a month or less □ 3. Two to four times a month
□ 4. Two to three times a week □ 5. Four to six times a week □ 6. Every day

On the days you drank alcohol, how many drinks did you have?

Number of traditional alcoholic drinks |__|__| Number of large bottles of beer (6 3cl) |__|__|
Number of small bottles of beer (33 cl)|__|__| Number of alcohol packages |__|__|
Number of glasses of other alcohol |__|__|=> Specify which other alcohol and its content: _____

In the past 6 months, have you ever had 6 or more drinks (and/or 3 or more large bottles of beer) on one occasion?

□ 1. Never □ 2. At least once a month □ 3. Several times a month
□ 4. Once a week □ 5. Every day or so

- **TOBACCO**

Do you smoke conventional cigarettes?

□ 1. Never □ 2. Yes, I have smoked in the past, but I stopped □ 2. Yes, I currently smoke

When did you start smoking? |__|__| years ago

How many cigarettes do you smoke per day? |__|__|

SEXUAL BEHAVIORS

Now I'm going to talk about intimate issues, which may put you at risk of transmission. Everything we talk about is strictly confidential and your answers are anonymous.

In the past six months, have you had sexual intercourse? □ 1. Yes □ 2. No

If yes, how many partners have you had in the past 6 months? |__|__|

In the past 6 months, have you used a condom with your spouse (husband/wife) or fiancé(e)/boyfriend (if not married)?

□ 1. Yes always □ 2. Yes sometimes □ 3. No never □ 4. Not applicable

In the past 6 months, have you used a condom with your other partners?

□ 1. Yes always □ 2. Yes sometimes □ 3. No never □ 4. Not applicable

Do you ever have casual sexual partners (including prostitutes) while traveling for work?

□ 1. Yes □ 2. No □ 3. Not applicable (no travel for work)

If yes, the last time you had a casual partner, did you use a condom? □ 1. Yes □ 2. No

Health-related knowledge

GENERAL KNOWLEDGE ON CHB

Have you ever heard of liver diseases (also called fat bellies or yellow eyes)?
□ 1. Yes (at least one of these) □ 2. No

If yes, do you or someone you know suffer from any of these diseases?

Yourself	□ 1. Yes	□ 2. No
A member of your household	□ 1. Yes	□ 2. No
A family member (not living in your household)	□ 1. Yes	□ 2. No
An acquaintance	□ 1. Yes	□ 2. No

Have you ever heard of hepatitis B? □ 1. Yes □ 2. No, today is the first I've heard of it.

If yes, do you think there is a link between liver disease and hepatitis B? □ 1. Yes □ 2. No

Do you think a person who has hepatitis B can transmit the disease in the following situations?

During unprotected sex	□ 1. Yes □ 2. No
When talking with another person	□ 1. Yes □ 2. No
By contact with blood	□ 1. Yes □ 2. No
Through saliva	□ 1. Yes □ 2. No
From mother to child during pregnancy/childbirth	□ 1. Yes □ 2. No

Is there is a vaccine that protects against hepatitis B? □ 1. Yes □ 2. No

Have you ever been tested for CHB? □ 1. Yes □ 2. No
=> If possible, ask to consult the health record to verify this information

Date of last CHB testing? Month: |__|__| Year: |__|__|

Do you know what your test result was?
□ 1. Yes positive □ 2. Yes negative □ 3. No (don't know)

=> If never tested: **Why were you never tested for CHB?**
□ 1. Had never heard of it/been offered a test □ 2. No money to pay for it
□ 3. Didn't want to know □ 4. Afraid of discriminations / confidentiality breaches
□ 5. Other **=> Specify**: _____

Health seeking skills and beliefs, and self-efficacy

PERCEIVED COMPETENCY

Please respond to each of the following items in terms of how true it is for you with respect to dealing with your health.

- I feel confident in my ability to manage my health
□ 1. Fully agree □ 2. Agree □ 3. Neither agree nor disagree □ 4. Disagree □ 5. Fully disagree
- I am capable of handling my health now
□ 1. Fully agree □ 2. Agree □ 3. Neither agree nor disagree □ 4. Disagree □ 5. Fully disagree
- I am able to control my behaviors to achieve positive
□ 1. Fully agree □ 2. Agree □ 3. Neither agree nor disagree □ 4. Disagree □ 5. Fully disagree
- I feel able to meet the challenges of remaining healthy
□ 1. Fully agree □ 2. Agree □ 3. Neither agree nor disagree □ 4. Disagree □ 5. Fully disagree

Self-governance and self-management and perceived self-governance and management to achieve health outcomes

PERCEPTION OF EMPOWERMENT

Imagine a ten step ladder, where on the bottom, the first step, stand people who are completely coerced or powerless, and on the highest step, the tenth step, stand those with the most ability to advance goals that they value in their own homes and in the world.

On which step are you today? |__|__|

Intrinsic motivation to achieve desirable health outcomes

RELATIVE AUTONOMY INDEX

When you go to the dispensary, or the hospital for a health issue or a question about your health you do it...

- Because it is your duty/responsibility	□ 1. Agree	□ 2. Disagree
- Because you will get in trouble otherwise	□ 1. Agree	□ 2. Disagree
- Because it corresponds to your preferences	□ 1. Agree	□ 2. Disagree
- Because that is what your family members tell you to do	□ 1. Agree	□ 2. Disagree
- Because you want to	□ 1. Agree	□ 2. Disagree
- So your family members won't get angry with you	□ 1. Agree	□ 2. Disagree
- Because you personally believe it's the right thing to do whether or not your family members agree	□ 1. Agree	□ 2. Disagree
- Because you want your family members to like you	□ 1. Agree	□ 2. Disagree

Social norms

DECISION-MAKING LATITUDE

In your household, when a decision has to be made about…

		Who has the last word?	
… your health	□ 1. You alone	□ 2. You along with someone else	□ 3. Someone else
… daily needs	□ 1. You alone	□ 2. You along with someone else	□ 3. Someone else
… large household purchases	□ 1. You alone	□ 2. You along with someone else	□ 3. Someone else
… visits to family and relatives	□ 1. You alone	□ 2. You along with someone else	□ 3. Someone else

Material circumstances

ECONOMIC ACTIVITY

In the past 12 months, have you been involved in your household's farming activities? □ 1. Yes □ 2. No

If no, during the previous winter, were you hired by another household to work in the fields?
□ 1. Yes □ 2. No

How much did you earn for the entire farming period? |__|__|__| |__|__| CFA

In addition to the common fields in your household, do you cultivate a field (peanut, niebe, bissap, watermelon, ...) that belongs to you? □ 1. Yes □ 2. No

During the last 12 months, other than working in the fields, did you engage in any other economic activity?
□ 1. Yes □ 2. No

If yes, which activity?
□ 1. Fisherman - Breeder
□ 2. Street trade
□ 3. Small business (donuts in front of the house, doorstep business, ...)
□ 4. Established business (business with a store, restaurant owner - refreshment stand)
□ 5. Health personnel (nurse, lab technician, midwife...)
□ 6. Educator/Teacher
□ 7. Domestic worker/gardener/cook
□ 8. Craftsman/Mechanic/Mason
□ 9. Community health worker/matron/traditional birth attendant
□ 10. Clerk /employee
□ 11. Driver, chauffeur
□ 12. Seamstress / Laundry
□ 13. Other **=> Specify**: _____

In the past 12 months, how much did you earn for this activity?
|__|__|__| |__|__| CFA

↳ FOR THE INACTIVE
If in the past 12 months you have not worked/been economically active, what is your current situation?
□ 1. Looking for a job □ 2. Elderly person no longer working/retired
□ 3. Study/training □ 4. Disability/ permanent disability/ long-term illness
□ 5. Other (homemaker)

HOUSEHOLD AGRICULTURAL RESOURCES

Does your household have an agricultural activity? □ 1. Yes □ 2. No

If yes, how much income did your household get from the sale of all its crops for the year 2017 (January-December)? |__|__|__| |__|__|__| |__|__|__| CFA

Does your household grow peanuts? □ 1. Yes □ 2. No

If yes, how much was produced for the year 2017 (January-December)? |__|__|__| |__|__|__| kg

Did your household sell any of it? □ 1. Yes □ 2. No

If yes, how much income did your household get from the sale of peanuts for the year 2017 (January-December)? |__|__|__| |__|__|__| |__|__|__| CFA

How many animals do you estimate you have in your kitchen (livestock)?
- Poultry (chickens, ducks, etc.)
□ 1. None □ 2. Less than 10 heads □ 3. ≥ 10 heads
- Small livestock (goats, sheep, pigs)
□ 1. None □ 2. Less than 10 heads □ 3. ≥ 10 heads
- Large livestock (cows, horses, donkeys)
□ 1. None □ 2. Less than 10 heads □ 3. ≥ 10 heads

In 2017, did you sell any animals (poultry, small livestock, large livestock)?
□ 1. Yes □ 2. No

If yes, how much money was obtained from the sale of these animals? |__|__| |__|__|__| |__|__|__|CFA

How many of the following animals or farm equipment do you own? (*code 0 if the person does not own the animal or equipment listed)*

Horse	|__|__|	Donkey	|__|__|
Cow	|__|__|	Seeding drill	|__|__|
Hoe	|__|__|	Tractor	|__|__|
Plough	|__|__|	Mill	|__|__|

Other => **Specify:** _____ |__|__|

OTHER SOURCES OF INCOME

In 2017, did you receive money from relatives/family living in Senegal or abroad? □ 1. Yes □ 2. No

How much did you receive (for the year 2017)? |__|__| |__|__|__| |__|__|__|CFA

Have you ever applied for the Family Security Grant from the Government of Senegal? □ 1. Yes □ 2. No

If yes, what was the result?
□ 1. Recipient □ 2. Waiting List **=> Since when** |__|__| Month |__|__| Year □ 3. Not eligible

If not, why did you no apply?
□ 1. Did not know about this grant / never heard of it □ 2. Application too long/complicated
□ 3. Don't need it/don't think the household is eligible □ 4. Other. **Specify**: _____

↳ *Only for recipients of the Government Family Security Grant*
When did you receive the first payment? |__||__| Month |__|__| Year
How many payments have you received? |__|__|
Amount of your last payment: |__|__|__| |__|__|__|CFA

FOOD SECURITY

During the May-November 2017 agricultural season, did your kitchen grow millet? □ 1. Yes □ 2. No

Did you start eating the new millet before the 2018 harvest ended? □ 1. Yes □ 2. No

During the last lean season (May-June 2018), did you need to buy millet?
□ 1. Yes □ 2. No
If yes, how much millet did you buy? |__||__| TAC
If yes, for what amount? |__|__|__| |__|__| CFA

With what money did you buy this millet? *(several answers possible)*
□ 1. By selling other agricultural crops □ 2. By selling animals
□ 3. With the help of income from off-farm activities □ 4. Through a loan (from a relative, neighbor)
□ 5. Barter □ 6. With the help of savings (money set aside)
□ 7. Other => **Specify:** _____

During the year 2017, did you receive food aid? □ 1. Yes □ 2. No

If yes, how much millet did you receive? |__||__| TAC

Source of food aid
□ 1. Donation of a related or neighboring kitchen □ 2. Loan of grain from a related or neighboring kitchen
□ 3. State Food Assistance Program □ 4. Other => **Specify:** _____

During the year 2017, did you give or lend money to another kitchen? (several answers possible)
□ 1. Yes, donating money to another kitchen □ 2. Yes, lending money to another kitchen □ 3. No

If donations or loans to another kitchen
2017 donations |__|__|__| |__|__| CFA
2017 loans |__|__|__| |__|__| CFA

HOUSING & EQUIPMENT

Does your household have the following goods?

□ 1. Radio □ 2. TV □ 3. DVD payer or CD/MP3 player
□ 4. Mobile phone/cell phone □ 5. Bicycle □ 6. Motorbike
□ 7. Solar panels or generator □ 8. Fan □ 9. Air conditioner
□ 10. Mosquito net □ 11. Living room furniture

Does your household have any of the following goods that can generate income through rental?
(assets on site and in working order)
□ 1. Car □ 2. Truck or bus □ 3. Cart
□ 4. Refrigerator or freezer □ 5. Sewing machine □ 6. Shelling machine
□ 7. Oil mill/press □ 8. Millet mill □ 9. Computer/tablet
□ 10. Storage warehouse □ 11. Equipment for a craft activity (mason, cabinetmaker, welder)

Does your kitchen have a small store? □ 1. Yes □ 2. No

What is the main source of water for your household?
□ 1. Drilling in the concession □ 2. Faucet in the concession
□ 3. Drilling / fountain in the village □ 4. Well in the concession
□ 5. Well in a neighboring concession

What energy source do you use for lighting?
□ 1. Wood/straw/candle fires □ 2. Lamp (oil / gas / oil) □ 3. Flashlight (with batteries)
□ 4. Grid electricity □ 5. Solar panel □ 6. Generator

What is the main source of energy for cooking meals in your kitchen?
□ 1. Grid electricity □ 2. Gas cylinder □ 3. Oil, gasoline
□ 4. Manure, dung □ 5. Charcoal □ 6. Wood

How many rooms (huts or bedrooms) does the household's compound have for sleeping? |__||__|

Does the household have room(s) for rent? □ 1. Yes □ 2. No

How many rooms for rent does the household have? |__|__| rooms

In 2017, what revenue was generated from the rental of this(ese) room(s)? |__|__|__| |__|__| CFA

Please indicate for the main living area, the composition of the roof, walls and floor *(to be completed by the interviewer)*
- Roof
□ 1. Straw □ 2. Sheet metal □ 3. Fibrocement □ 4. Cement

- Walls
□ 1. Millet stems □ 2. Banco or clay □ 3. Stabilized banco □ 4. Cement
□ 5. Wood □ 6. Sheet metal

- Floor
□ 1. Banco □ 2. Cement □ 3. Sand □ 4. Tile

Political, economic and social security

JOB QUALITY AND SECURITY

Is farming your main activity (the one you spend the most time on)?
□ 1. Yes, it's my main activity □ 2. No, I have a secondary activity □ 3. No, I do not farm

During the last 12 months, did you engage in an economic activity other than farming? □ 1. Yes □ 2. No

If yes, in this activity, you work as a:
□ 1. Civil servant □ 2. Employee (written contract) □ 3. Employee (oral agreement)
□ 4. Self-employed (no employees) □ 5. Contractor/ boss with employee(s) □ 6. Apprentice
□ 7. Home help

In the past 12 months, how many months did you work for this activity? |__|__| months

On average, how many days did you work in a month of activity? |__| full days |__|half days

As part of this activity, did you have to leave your home to work (at least 7 days away)?
□ 1. Yes => How long (over the past 12 months)? |__|__| days OR|__|__| months □ 2. No

HEALTH INSURANCE

Do you have health insurance or a community health insurance plan? □ 1. Yes □ 2. No

If yes, what type of health insurance do you have?
□ 1. Community health insurance □ 2. Health insurance through your employer
□ 3. Other types of insurance => **Specify**: _____

Are you the primary member? *(Primary member = person who pays the membership fee)*
□ 1. Yes (= I pay the fee) □ 2. No (= my spouse or other household member pays the contribution)

If yes, how much do you pay? |__|__|__|__|__|CFA Period**:** □ 1. Monthly □ 2. Annual

If no, who pays? |__|__|__|__|__| *Interviewer instruction: find the individual identifier from the kitchen grid*

Who is covered by this insurance/mutual? *(multiple answers possible)*
□ 1. Yourself □ 2. Your children □ 3. Your spouse(s)
□ 4. Other members of the kitchen

Are you up to date with your dues? □ 1. Yes □ 2. No

CERTIFICATES OF INDIGENCE

Have you ever heard of the indigent status or of the certificates of indigence? □ 1. Yes □ 2. No

Have you, or anyone in your kitchen, ever applied for indigent status/certificate?
□ 1. Yes, me personally □ 2. Yes, another member my kitchen □ 3. No/don't know

To whom? □ 1. Village chief □ 2. Services of the Prefecture □ 3. Social Services at the hospital
□ 4. Other. **Specify**: _____

When did you apply? *(if multiple requests, date of last request)* Month: |__|__| Year: |__|__|

Did you get it? □ 1. Yes □ 2. No

If yes, were you able to receive free or reimbursed (covered) care because of this certificate?
□ 1. Yes, only once □ 2. Yes, many times □ 3. No

If yes, for what total amount? (consider all care obtained free of charge or reimbursed since obtaining the certificate) |__|__|__| |__|__|__| |__|__|__| CFA

Access and utilization of healthcare services

In the past 12 months, have you been hospitalized? □ 1. Yes □ 2. No

In the past 3 months, have you had a health problem (illness or injury)? □ 1. Yes □ 2. No

Because of this health problem, how many days in the last 3 months have you been unable to work? |__|__| days

Because of this health problem, how many days in the last 3 months have you not been able to do your daily activities? |__|__| days

Have you consulted for this illness? □ 1. Yes □ 2. No

Who did you consult? (*several answers possible)*
□ 1. Healer-marabou / Malongo center □ 2. Case / health post □ 3. Dispensary
□ 4. Health Center □ 5. Hospital □ 6. Other => **Specify**: _____

If you did not consult, why not?
□ 1. Not a serious illness □ 2. Too expensive □ 3. No doctor
□ 4. Health services too far □ 5. Waiting time too long □ 6. Not well received
□ 7. Didn't need anyone □ 8. No treatment available □ 9. Other **=> Specify**: _____

For this illness, did you use self-medication? (= taking medication without consulting a caregiver/healthcare professional authorized to prescribe them) □ 1. Yes □ 2. No

If yes, where did you get these medications?
□ 1. Grocery store □ 2. Drug depot or pharmacy □ 3. Store
□ 4. Market □ 5. Friend/Family □ 6. Other **=> Specify**: _____

↳ FOR WOMEN

Have you ever had a pregnancy carried to term?
□ 1. Yes **=> Number of pregnancies (carried to term):** |__|__| □ 2. No

Did you have a cesarean section for any of your deliveries? □ 1. Yes □ 2. No

Are you currently pregnant (for at least 3 months)? □ 1. Yes □ 2. No

If yes, for your current pregnancy, did you go to antenatal care visits (ANC) at a health facility?
□ 1. Yes => **How many ANC visits did you go to?** |__|__| □ 2. No

For your last full-term pregnancy, did you go to antenatal care visits (ANC) at a health facility?
□ 1. Yes => **How many ANC visits did you go to?** |__|__| □ 2. No

When did you last give birth? |__|__| (month) |__|__| (year)

Did you give birth in a health facility? □ 1. Yes □ 2. No

↳ *TO ALL*

In the past 3 months, have you used the following healthcare services:

- Medication

□ 2. No

□ 1. Yes => **Who paid for it?** □ 1. You □ 2. Your spouse □ 3. A household member □ 4. Someone else
=> **Was this care (or part of this care) covered by your insurance?** □ 1. Yes □ 2. No
If yes, amount covered: |__|__| |__|__|__| |__|__|__|CFA

- Consultation with health professionals

□ 2. No

□ 1. Yes => **Who paid for it?** □ 1. You □ 2. Your spouse □ 3. A household member □ 4. Someone else
=> **Was this care (or part of this care) covered by your insurance?** □ 1. Yes □ 2. No
If yes, amount covered: |__|__| |__|__|__| |__|__|__|CFA

- Medical exams (laboratory, radiology, ...)

□ 2. No

□ 1. Yes => **Who paid for it?** □ 1. You □ 2. Your spouse □ 3. A household member □ 4. Someone else
=> **Was this care (or part of this care) covered by your insurance?** □ 1. Yes □ 2. No
If yes, amount covered: |__|__| |__|__|__| |__|__|__|CFA

- Hospitalization

□ 2. No

□ 1. Yes => **Who paid for it?** □ 1. You □ 2. Your spouse □ 3. A household member □ 4. Someone else
=> **Was this care (or part of this care) covered by your insurance?** □ 1. Yes □ 2. No
If yes, amount covered: |__|__| |__|__|__| |__|__|__|CFA

- During the last 3 months, have you had expenses for travel (transportation: cab, bus, etc.) related to your health care (going to the hospital/health center/dispensary ... to consult, to have exams, to buy medicine, ...)?

□ 1. Yes => **What was the amount?** ||__|__|__| |__|__|__|CFA □ 2. No

ONLY FOR CHB PATIENTS – follow-up post-survey (PeCSEN study)

Retrieved CHB testing results □ 1. Yes □ 2. No

Undertook further examination to assess stage of liver disease □ 1. Yes □ 2. No

Referral to a healthcare facility for follow-up

□ 1. No referral □ 2. Niakhar healthcare center □ 3. Fatick healthcare center
□ 4. Fatick hospital □ 5. Sen-B cohort (Fann hospital) □ 6. Other **=> Specify** _____

Follow-up visits: |__| visits (July 2019-September 2021)

PERCEIVED ABILITY TO OVERCOME BARRIERS TO HEALTHCARE SEEKING

Many different factors can prevent someone from getting medical advice or treatment for themselves. When you are sick and want to get medical advice or treatment, is each of the following a big problem or not?

Knowing where to go is… □ 1. Not a problem □ 2. A small problem □ 3. A big problem
Getting permission to go is… □ 1. Not a problem □ 2. A small problem □ 3. A big problem
Getting the money to pay is… □ 1. Not a problem □ 2. A small problem □ 3. A big problem
The distance to the health facility is… □ 1. Not a problem □ 2. A small problem □ 3. A big pb
Having to take transport is… □ 1. Not a problem □ 2. A small problem □ 3. A big problem
Not wanting to go alone is… □ 1. Not a problem □ 2. A small problem □ 3. A big problem
Concern that you might be discriminated is… □ 1. Not a proble □ 2. A small problem □ 3. A big pb
|-> For which reason? □ 1. Ethical or cultural identity □ 2. Gender □ 3. Sexual orientation
□ 4. Age □ 5. Illness or disability □ 6. Religion □ 7. Socio-economic group□
8. Education level □ 9. Other **=> Specify** _____

B. One-on-one interviews

Check-list to guide questions and document the entirety of the profile for each participant

Themes	*Possible questions*
Health status and health functioning – *How is your health?*	
□ General health (physical and mental health, fatigue)	Can you tell me about your health (pain, emotional problems, fatigue...)?
□ Hepatitis B status	Do you know if you have hepatitis B?
□ Other diseases	Do you have any other diseases?
Health knowledge – *What do you know of hepatitis B?*	
□ Own CHB status	Do you know if you have chronic hepatitis B infection?
□ CHB transmission and course of the disease	What is chronic hepatitis B infection? How does one get it? What happens when someone has chronic hepatitis B?
□ Prevention of infection (vaccine) and complications (treatment)	Can we protect ourselves from chronic hepatitis B? Is there a vaccine? a medication? tests?
□ Risk behaviors (alcohol, tobacco, food)	Are there things that should be done (or avoided) in relation to hepatitis B?
□ Sources/search for **good** information	How do you get credible information about health? about hepatitis B? *(WHO, Ministry of Health, Hepatitis Program, radio, health post, healer, internet, etc.)*
Health-seeking skills and beliefs, self-efficacy – *For you, is it easy to be healthy?*	
□ Confidence in avoiding disease and avoiding CHB infection and complications	Is it easy for you to avoid getting sick? Is it easy to avoid getting sick with CHB?
□ Ability to learn about health and/or CHB	Have you ever learned any health-related skills (e.g., how to take a medication, how to prevent, or how to monitor a health problem such as CHB)?
□ Ability to change health behavior in relation to CHB	Have you ever changed your habits for health reasons (for example, going on a diet, or stopping drinking or smoking)? for CHB?
Health values and goals – *How important is health to you?*	
□ Health goals in general, compared to other priorities	How often do you think about your health? Do you think about it more or less than your work, or your family?
□ Disease/CHB goals	Is it important to you not to get sick with CHB? Do you think about it often?
□ Goals in relation to habits and health	Is it important/do you often think about changing things in your habits for your health or for CHB?
□ Conflicting goals in the family	Do people around you not want some of the things you do in relation to health or CHB? How do you react?
(Perceived) self-governance & self-management to achieve health outcomes – *How do you organize your life in relation to health?*	
□ Organization in everyday life	Can you tell me about a normal day, and explain how you organize your life between family, work, etc.?
□ Domestic and extra-familial tasks	Is it hard to manage things at home and things outside (work, health)? How do you do it?
□ Controlling health behaviors	Are you stopping yourself from doing things for your health/CHB?
□ Help and resources available for health	Do you ever ask for help from family or neighbors and get money or transportation for example, in relation to your health?
Effective health decision-making – *How do/did you make decisions about your health, and CHB?*	

□ Searching for and using information about CHB	Where did you look for information about CHB? Did it help you? How did you use the information?
□ Changes in CHB habits	Have you decided to change any of your habits regarding CHB *(diet, alcohol consumption)*?
□ CHB symptoms, consultation and treatment route	Do you have any signs of CHB-related disease? Have you decided to go see people about the disease *(healer, doctors)*? Take medication or have tests *(screening, follow-up)*?
□ Prevention of CHB infection and complications	Do you do anything to protect yourself or your family *(vaccine, hygiene)*?
Intrinsic motivation – *Why did you make these decisions?*	
□ Internal motivation	Why do you decide to do things (or not do things) for your health or in relation to CHB? Is this important to you?
□ External motivation	Is someone telling you to do this? Is it important to that person or group?
Positive expectations – *How do you see you future?*	
□ Expectations and concerns about CHB	Are you afraid of CHB (e.g., getting or being very sick with CHB)? Are you confident?
□ Expectations and concerns about health in general	Do you fear for your health (e.g. getting sick, dying young)? Do you have confidence?
I am now going to ask you about your environment: the things and people around you, in your village, in the area and the region.	
Social norms – *What do people in the area think of CHB, and what do they do about it?*	
□ Social norms on hepatitis B, vaccine, blood sampling	What do people think about CHB in the area? of hepatitis B vaccines? of people doing blood sampling?
□ Social norms on chronic carriers, alcohol, tobacco	What do they think of people with big bellies? of people who drink alcohol? of people who smoke?
□ Quantification of people who engage in these behaviors	Does it concern many people (see behaviors listed in 1. and 2.) or specific people? Which ones?
□ Discrimination and stigmatization of CHB patients and others in health facilities	Are some people or groups of people unable to get vaccinated or tested? Are some people not well received at the health center (e.g., if they have CHB, if they drink alcohol)?
□ Social norms on health and CHB decision-making in the family	In a household, how does someone decide to go to the hospital if they are sick? Do you decide alone, or with the head of the household, or with someone else?
□ Changes in social norms related to CHB	Have people changed their minds about vaccination or alcohol or CHB? Do you think this is a good thing?
Social networks and social capital for achieving positive health outcomes – *Do you have help for your health and CHB?*	
□ Help available to do things	Are there people who can help you if you need to go to the clinic for a health problem?
□ Help available to talk about hepatitis B	Is there anyone you could talk to about your health problems, for example, about CHB?
□ Health information sharing processes	How do people share information about health and CHB (radio, marketplace, social networks)?
□ Poor health information related to hepatitis B	Are there people who share rumors about CHB or about certain behaviors, such as drinking a lot of alcohol...?
Group membership influences – *What do people close to you think of, and do about CHB?*	
□ Membership in groups/associations	Are you part of a group? an association? a political party? a team?
□ Social norms of these groups on hepatitis B	What do people in these groups think about CHB?
Material circumstances – *Can you tell me about your living conditions?*	
□ Economic situation: work (quantity, quality) and monetary resources	Do you have a job (temporary, permanent)? Do you earn money? Enough to live on?
□ Neighborhood: noise, cleanliness, facilities	What do you think of your hamlet (cleanliness, noise, facilities and access to the road/Fatick)?

□ Water (cleanliness, access), hygiene, waste	Where do you get water to drink? To go to the bathroom? To wash yourself? Is the water clean? What do you do with the garbage?
□ Housing: comfort, heat protection	Where do you live? Is your home comfortable (heat protection, number of inhabitants)?
□ Food (quantity, diversity, quality)	Do you eat well? Who is in charge of choosing and cooking the food? What happens if there is not enough to eat?
□ Environment: pollution, disease	Are there any pollution problems around you (e.g. air pollution or pesticides)? Are there many diseases (including CHB)?
Economic, political and social security – *What do you think of the economic, social and political situation in your area/country?*	
□ Quality of work and protection of workers	How easy is it to find a good job? What happens if someone is sick and can no longer work?
□ Social security (social services, health insurance)	Who can help if people are sick or need money to go for treatment (the government, social service, family, neighbors)? Do you know about non-for-profit community-based insurance companies?
□ General political situation	What is the political situation (elections, corruption…) in the area/region/country? Is there insecurity or delinquency?
Utilization and access to health services – *What do you do when you have a serious health problem? What would you do if you had a serious health problem related to CHB?*	
□ Symptoms of CHB-related diseases	Do you have any signs of a CHB-related illness (e.g., yellow eyes, stomach pain, swollen belly)?
□ Symptoms of other diseases	Do you have any signs of other health problems?
□ Willingness to seek medical attention for a health problem	Tell me about the last time you went to see someone for your health (which problem, traditional practitioner or doctor...)
□ Availability of CHB health services	Do you know if it is possible to be vaccinated, screened or followed for CHB in your area?
□ Barriers and obstacles to accessing care	Do you have any problems going to the health center or hospital (finding money, getting around, long waits...)?
Enabling public health and health care systems – *What is your perception on the work the healthcare facilities and health authorities (ministry representatives, physicians, dispensaries, health center, regional hospital and hospitals in Dakar) are doing in helping you taking care of your health, including when it comes to CHB?*	
□ Information and advice on CHB	In health centers or hospitals, what information/advice have you been given about CHB?
□ Protection against CHB (screening, vaccine)	Have you ever been offered CHB screening or vaccine? Are you being monitored for CHB?
□ Efficiency and quality of care (including accountability)	Have you ever had a problem with a doctor, health center or hospital for yourself or your family? Tell me about your last experience at a health center (if none, ask about the family).

C. Interviews with local CHB stakeholders

Discussion guide for focus groups or one-on-one interviews depending on participants' availability.

Social norms – *What do people in the Niakhar area think of CHB, and what do they do about it?*	
□ Social norms on hepatitis B, vaccine, blood sampling	What do people think about CHB in the area? of hepatitis B vaccines? of people doing blood sampling?
□ Social norms on chronic carriers, alcohol, tobacco	What do they think of people with big bellies? of people who drink alcohol? of people who smoke?
□ Quantification of people who engage in these behaviors	Does it concern many people (see behaviors listed in 1. and 2.) or specific people? Which ones?
□ Discrimination and stigmatization of CHB patients and others in health facilities	Are some people or groups of people unable to get vaccinated or tested? Are some people not well received at the health center (e.g., if they have CHB, if they drink alcohol)?
□ Social norms on health and CHB decision-making in the family	In a household, how does someone decide to go to the hospital if they are sick? Do they decide alone, or with the head of the household, or with someone else?
□ Changes in social norms related to CHB	Have people changed their minds about vaccination or alcohol or CHB? Do you think this is a good thing?
Social networks and social capital for achieving positive health outcomes – *Do people have help for their health and CHB?*	
□ Help available to do things	Do people get help if they need to go to the clinic for a health problem?
□ Help available to talk about hepatitis B	Do people have support to talk about their health problems, for example, about CHB?
□ Health information sharing processes	How do people share information about health and CHB (radio, marketplace, social networks)?
□ Poor health information related to hepatitis B	Are there people who share rumors about CHB or about certain behaviors, such as drinking a lot of alcohol...?
Group membership influences – *What do people in groups think of, and do about CHB?*	
□ Membership in groups/associations	What are the main group, associations, political party, sports team active in the Niakhar area?
□ Social norms of these groups on CHB	What do people in these groups think about CHB?
Material circumstances – *What are people's living conditions?*	
□ Economic situation: work (quantity, quality) and monetary resources	Do most people have a job (temporary, permanent)? Do they earn enough money to live comfortably?
□ Neighborhood: noise, cleanliness, facilities	What are most people's neighborhoods like (cleanliness, noise, facilities and access to the road/Fatick)?
□ Water (cleanliness, access), hygiene, waste	Where do people get water to drink? To go to the bathroom? To wash themselves? Is the water clean? What do they do with the garbage?
□ Housing: comfort, heat protection	Are people's homes comfortable (heat protection, number of inhabitants)?
□ Food (quantity, diversity, quality)	Do they eat well? Who is in charge of choosing and cooking the food? What happens if there is not enough to eat?
□ Environment: pollution, disease	Are there any pollution problems around (e.g. air pollution or pesticides)? Are there many diseases (including CHB)?
Economic, political and social security – *What is the economic, social and political situation in the area/country?*	
□ Quality of work and protection of workers	How easy is it to find a good job? What happens if someone is sick and can no longer work?
□ Social security (social services, health insurance)	Who can help if people are sick or need money to go for treatment (the government, social service, family, neighbors)? Do they know about non-for-profit community-based health insurance companies?

□ General political situation	What is the political situation (elections, corruption…) in the area, region or country? Is there insecurity or delinquency?
Utilization and access to health services – *What do people do when they have a serious health problem, including related to CHB?*	
□ Symptoms of CHB-related diseases □ Symptoms of other diseases □ Willingness to seek medical attention for a health problem □ Availability of CHB health services □ Barriers and obstacles to accessing care	What do people do when they have any signs of a CHB-related illness (e.g., yellow eyes, stomach pain, swollen belly)? When they have signs of other health problems? Do you know if it is possible to be vaccinated, screened or followed for CHB in the Niakhar area? Do people have any problems going to the health center or hospital (finding money, getting around, long waits...)?
Enabling public health and health care systems *What is your perception on the work the healthcare facilities and health authorities (ministry representatives, physicians, dispensaries, health center, regional hospital and hospitals in Dakar) are doing in helping people taking care of their health, including when it comes to CHB? What are the strengths and weaknesses, and how could it be improved?*	
□ Information and advice on CHB □ Protection against CHB (screening, vaccine) □ Efficiency and quality of care (including accountability)	In health centers or hospitals, what information/advice are given about CHB? Are people systematically offered CHB screening or vaccine? Are they being monitored for CHB? Do people often encounter problems with a doctor, health center or hospital related to the efficiency or quality of care? What usually happens when it is the case?

D. Health facility survey

Date |___|___| / |___|___| / |___|___|

Investigator _____

Name of the facility _____

Type of health facility ☐1 Public ☐2 Private for-profit ☐3 Private denominational
Town/city _____

MODULE 1: GENERAL RESOURCES

- **Staff**

	Full time	Part-time (> 1day/week)
a. Number of physicians	|___|___|	|___|___|
b. Number of nurses	|___|___|	|___|___|
c. Other staff (including cleaning, security, administration, etc.)	|___|___|___|	|___|___|___|

How many hospital beds does the health facility have? |___|___|___| *(set up at the time of the survey)*

Does the health facility have the following equipments?

a. Electrocardiography	☐0 No ☐1 Yes →Was it working at the time of the survey ☐1 Yes ☐0 No
b. Ultrasound	☐0 No ☐1 Yes →Was it working at the time of the survey ☐1 Yes ☐0 No
c. Radiology	☐0 No ☐1 Yes →Was it working at the time of the survey ☐1 Yes ☐0 No
d. Scanner	☐0 No ☐1 Yes →Was it working at the time of the survey ☐1 Yes ☐0 No
e. GenExpert	☐0 No ☐1 Yes →Was it working at the time of the survey ☐1 Yes ☐0 No

MODULE 2: RESOURCES FOR CHB VACCINATION, TESTING AND MANAGEMENT

Activity	Available	Workload over the past month *(indicate 0 if none in the past month but activity available)*
Birth dose	☐1 Yes ☐0 No	|__|__|__|__|__|__|__|
Pentavalent vaccine	☐1 Yes ☐0 No	|__|__|__|__|__|__|__|
CHB testing	☐1 Yes ☐0 No	|__|__|__|__|__|__|__| ⇨ |__|__|__| positive results
CHB follow-up exams/consultations	☐1 Yes ☐0 No	|__|__|__|__| CHB patients
CHB treatment prescription/follow-up	☐1 Yes ☐0 No	|__|__|__|__| treated patients

- **Staff involved in hepatitis B activities** (including laboratory and administrative staff e.g., social services)

	Level of education/training	Job	Working here since (month/year)	Hepatitis B activities (vacccination, couseling, consultation, analysis, etc.)	Ever trained for CHB ? (yes/no, cumulative duration of training)
1					
2					
3					

- **Pharmacy**

Is there tenofovir in the health facility ? ☐0 No ☐1 Yes |__|__|__|__| boxes available

☐1 For VIH patients

☐2 For CHB patients

(several answers possible)

Place of storage : _____

Rate of supply: |__| __|per week/month/year

- **Exams associated with CHB management**

	Available
Blood count	☐1 Yes ☐0 No
AST	☐1 Yes ☐0 No
ALT	☐1 Yes ☐0 No
Creatinine	☐1 Yes ☐0 No
Glycemia	☐1 Yes ☐0 No
Urea	☐1 Yes ☐0 No
Liver ultrasound	☐1 Yes ☐0 No
Fibroscan	☐1 Yes ☐0 No
HBsAg (testing)	☐1 Yes ☐0 No
Viral load	☐1 Yes ☐0 No
HBeAb	☐1 Yes ☐0 No
HIV	☐1 Yes ☐0 No
HDV	☐1 Yes ☐0 No
HCV	☐1 Yes ☐0 No

MODULE 3: TESTING

If testing is NOT available in the health facility

Is hepatitis B testing offered to pregnant women during ANC visits? ☐1 Yes ☐0 No

If yes, where are pregnant women are referred to? _____

Distance between the referral place and the health facility |__|__|__| km

Is hepatitis B testing grouped with other analyses included in the antenatal care exams? ☐1 Yes ☐0 No

⇨ *Go to the next module*

For ANC visits, is hepatitis B testing grouped with other analyses included in the antenatal care exams?
☐1 Yes ☐0 No

Type(s) of test(s) available for CHB testing

Rapid test: ☐1 Yes => _____ ☐0 No

Serological test: ☐1 Yes => _____ ☐0 No

Resources employed during testing *(to be filled through observation)*

Resources	**Quantity**
Counseling	
Staff involved in counseling *(indicate average time for one patient)*	*Example: head nurse (20 minutes)* 1. 2.
Testing	
Consumables *(indicate quantity for one test)*	*Example : needles (1 needle)* 1. 2.
Staff involved *(indicate average time for one patient)*	1. 2.
Analysis	
Consumables *(indicate quantity for one test or quantity of tests analyzed at once if grouped in a bundle)*	1. 2. 3.
Machines/devices *(indicate the reference and date of purchase)*	1. 2.
Staff involved *(indicate average time for one test or bundle of tests)*	1. 2.
Counseling post-test	
Time between the test and the results delivered to the patient	In the past month - Minimum time - Maximum time - Average time
Consumables *(indicate quantity for result delivery to one patient)*	1. 2.
Staff involved *(indicate average time for one patient)*	1. 2. 3.
Notes on the information delivered (content and quality)	

MODULE 4: CHB MANAGEMENT

Go to the next module if CHB management is NOT available in this health facility

Resources	Quantity
Consultation/medical examination	
Staff involved *(indicate average time for one patient)*	*Example : Physician (20 minutes)* 1. 2.
Blood sampling	
Consumables *(indicate quantity for one patient)*	*Example: sampling tubes (5 tubes)* 1. 2.
Staff involved *(indicate average time for one patient)*	1. 2.
Imagery	
Consumables *(indicate quantity for one patient)*	*Example: echography gel (1/50 tube)* 2. 3. 4.
Machines/devices *(indicate the reference and date of purchase)*	1. 2.
Staff involved *(average time for one patient)*	1. 2.
Result delivery/follow-up visit	
Time between the test and the results delivered to the patient	In the past month - Minimum time - Maximum time - Average time
Consumables *(quantity for one patient)*	1. 2.
Staff involved *(average time for one patient)*	1. 2.

Observation

First visit

- General organization
- Clinical examination
- Exams prescribed
- Time until the next visit : jusqu'à prochaine visite :

Follow-up visits

Frequency: ☐ Quaterly ☐ Bi-annual ☐ Annual ☐ Other =>_____

Key exams	Resources required	Challenges[1]
Echography		
Fibroscan		
Viral load		

[1] Is it working at the moment? Does it often breaks down? Ever running out of consumables/reagents? Any other issues?

MODULE 4: COSTS FOR THE HEALTH FACILITY

Consumables

(to be filled with information from module 3 and 4)

Type of consumable and quantity (unit/bundle)	Cost	Date of the invoice used for the cost estimation
Example: box of 10 needles	*3,000 CFA*	*February 2022*

Equipments

Equipment *n*	
Type of equipment (brand)	
Price (date of purchase)	
Costs of revision (frequency)	
Staff training (duration in days)	

Staff (including support and administration)

Job/training	Monthly salary	Date of the reference salary
Example: nurse	*300,000 CFA*	*January 2022*

Fixed costs (buildings, invoices, cars, etc.)

Type of costs	Cost (monthly or yearly)	Reference month/year
Example : electricity	*1,000,000 CFA (monthly)*	*January 2020*

MODULE 5: COSTS FOR THE PATIENTS

Type of intervention	Amount paid (0 if free)	Co-payment (insurance, free care for children/elderly/indigents)?
Testing		
Counseling/consultation before CHB testing	|__|,|__|__|__|,|__|__|__|CFA	☐1 Yes ☐0 No Details: _____
Testing	|__|,|__|__|__|,|__|__|__|CFA	1 Yes ☐0 No
Result/post-test counseling	|__|,|__|__|__|,|__|__|__|CFA	Details: _____
CHB management		
Consultation	|__|,|__|__|__|,|__|__|__|CFA	☐1 Yes ☐0 No Details: _____
Blood count	|__|,|__|__|__|,|__|__|__|CFA	☐1 Yes ☐0 No Details: _____
AST/ALT	|__|,|__|__|__|,|__|__|__|CFA	☐1 Yes ☐0 No Details: _____
Creatinin	|__|,|__|__|__|,|__|__|__|CFA	☐1 Yes ☐0 No Details: _____
Glycemia	|__|,|__|__|__|,|__|__|__|CFA	☐1 Yes ☐0 No Details: _____
Urea	|__|,|__|__|__|,|__|__|__|CFA	☐1 Yes ☐0 No Details: _____
Liver echography	|__|,|__|__|__|,|__|__|__|CFA	☐1 Yes ☐0 No Details: _____
Fibroscan	|__|,|__|__|__|,|__|__|__|CFA	☐1 Yes ☐0 No Details: _____
Viral load	|__|,|__|__|__|,|__|__|__|CFA	☐1 Yes ☐0 No Details: _____
HBeAb	|__|,|__|__|__|,|__|__|__|CFA	☐1 Yes ☐0 No Details: _____
HIV	|__|,|__|__|__|,|__|__|__|CFA	☐1 Yes ☐0 No Details: _____
HDV	|__|,|__|__|__|,|__|__|__|CFA	☐1 Yes ☐0 No Details: _____
HCV	|__|,|__|__|__|,|__|__|__|CFA	☐1 Yes ☐0 No Details: _____
Hospitalization (per day)	|__|,|__|__|__|,|__|__|__|CFA	☐1 Yes ☐0 No Details: _____
Treatment		
Medication _____	|__|,|__|__|__|,|__|__|__|CFA Duration : _____ *(monthly/yearly)*	☐1 Yes ☐0 No Details: _____
Other (e.g., transport, administrative costs, etc.)		
	|__|,|__|__|__|,|__|__|__|CFA	☐1 Yes ☐0 No Details: _____
	|__|,|__|__|__|,|__|__|__|CFA	☐1 Yes ☐0 No Details: _____