

Pandemic Spikes and Broken Spears:
Indigenous Resilience after the Conquest of Mexico
Online Appendix

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Abstract

This document contains the Online Appendix referred to in “Pandemic Spikes and Broken Spears: Indigenous Resilience after the Conquest of Mexico.”

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1 The *Suma de Visitas*

The original manuscript of the *Suma de Visitas de los Pueblos por Orden Alfabético* is kept in the collections of the Biblioteca Nacional of Madrid, Spain (MS 2800). Since its publication in 1905 by Francisco del Paso y Troncoso (1905) it has been used by scholars to reconstruct the demography of 16th century Mexico (Cook and Borah, 1960, Gerhard, 1972). René García Castro (2013) provides the most recent and a more accurate reconstruction of the document, also clarifying the hierarchy of the political jurisdictions contained in it.¹ We combined his reconstructions with data from Cook and Borah (1960), hand correcting mistakes where necessary. As explained below, geographic coordinates of all settlement locations from Cook and Borah (1960) were revised, matching their locations according to the *Marco Geoestadístico Nacional* of the Mexican Statistical Office, INEGI.

Cook and Borah (1960) used the *Suma de Visitas* to estimate the number of people paying tributes and population counts, obtaining a total of 6,300,000 inhabitants for Central Mexico. They provide evidence suggesting that the document was prepared in 1548, containing population counts from the preceding decade.² Why was the *Suma de Visitas* collected? The Spanish Crown sought to make the population of its new possessions "legible," mostly for the purpose of allocating *encomiendas* as rewards for the *conquistadores*, and in order to structure a capitation tax system. However, the first few decades after the conquest had no systematic census or a comprehensive overview that could allow Crown authorities and their bureaucrats to really understand the dimension of the demographic catastrophe unfolding.

The experience in the Caribbean islands, and the powerful indictment of Bartolomé de las Casas, led to the enactment of the *Nuevas Leyes* in 1542. These laws were meant to eliminate the form of quasi-slavery (or serfdom) involved in the *encomienda*. At the beginning of 1549, the Crown issues the *cédula* that forbid levying any form of personal services both in the mines and in *encomiendas*, effectively breaking the link between the possession of settlements and the use of forced labor. That same edict includes a provision indicating that there has to be a moderation in the tributes paid, following a prior order from April 19, 1546 (Miranda, 1952, p.125).³ By the 1540s, the initial period of the conquest

¹We thank René García Castro for sharing his Excel files, which systematically compile the organization of settlements contained in the document.

²Some important settlements are not listed in the original document. For example, as mentioned above, most of the large settlements connected to the Marquesado del Valle, the estate granted to the heirs of Hernán Cortés, are missing in the document. But with the current understanding of the document it is likely that the missing settlements were relatively small and that their population counts were subsumed in the *Suma de Visitas* descriptions under the larger settlements to which they belonged as political subjects. The document was originally dismissed as an unreliable population count by Cook and Simpson (1948) in their landmark study of the demography of Central Mexico, because they believed the tributary rosters were incomplete and the assessments belonging to different decades, with no systematic uniform collection of data. Their rejection of the document may have been due, in part, to the anomalous feature that the *Suma* suggested a population rebound or increase after the 1545 epidemic. This was an interpretation favored by George Kubler (1942), who suggested the document was commissioned precisely to account for the devastation caused by the *cocoliztli* epidemic of 1545, and to evaluate claims from colonists pressuring the Crown to repeal the New Laws that had abolished the *encomienda* in 1542. However, Cook and Borah (1960) revised their position, thoroughly analyzing the document and providing an estimate of the population counts at this early period.

³As noted by Reséndez (2016), these provisions were often not obeyed, particularly in the periphery of Nueva Vizcaya or Nueva Galicia, far away from Mexico City. However, Garfias and Sellars (2021) show how

had ended, with a relative pacification of most of the core areas of Central Mexico. This period constitutes a watershed in the transformation of the initial stage of armed conflict to a more regulated *Pax Hispanica*.⁴

1.1 Settlement descriptions

The document of the Suma is organized as an alphabetical list of settlement entries. Each of the settlements is assigned to a *comarca* or district. The 20 *comarcas* in the *Suma de Visitas* more or less correspond to the new founded Spanish cities. 904 settlements are mentioned and described in detail, with an additional 442 neighboring settlements mentioned without a description or population count. The routes that the officials followed for visiting the settlements are registered with a roman number. In the document there are 86 of these routes, known as *visitas*. There are four *visitas* without settlements visited (presumably lost) and a handful of settlements without a corresponding *visita*.

From these descriptions, we are able to estimate the number of inhabitants and georeference its location. We have descriptions that do not include the same information for each settlement, and there is no standardized way of presenting this (see Figure A1). Normally, however, we can extract information related to location, commodities, tribute and population. For locations, it is common to have the distance to a bigger town or the sea and if there are any mountains or rivers nearby. For commodities, it is typical to have examples of crops they grow, like maize and cacao. In some cases, they include the number of products that were used as a tribute.⁵ Tribute data was not collected in the initial phase of this compilation, but after Visita XXXV it is systematically provided. For population, it is rare to have a total number of people in the settlement. As was customary in the demographic information of this era, the information refers specifically to the number of single or married men, to households, elder people or to infants. For this reason, we follow the rules of thumb proposed by Cook and Borah (1960) to complete the data, using three inhabitants for each household or tributary male adult.

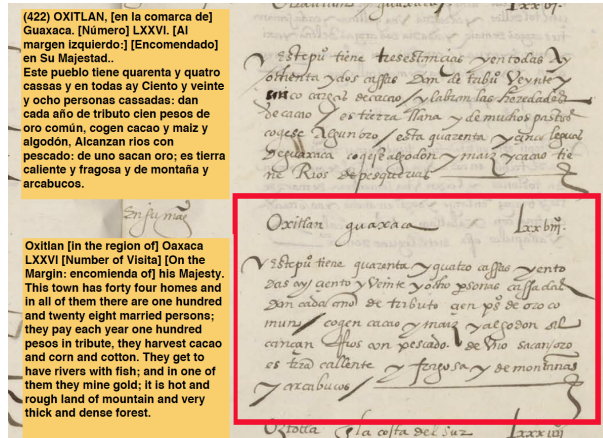
Approximately 18 settlements are repeated in the document because they were visited two times by different officials or they had a change of jurisdiction (García Castro, 2013). Also, there are some settlements that are clearly absent from the document, like Tenochtitlan, or settlements where we only have the mention of neighboring suburbs or settlements without

the transition to direct rule, instead of *encomienda*, gradually eliminated these feudal institutions.

⁴This does not mean the colonies were devoid of rebellion and armed conflict. The most important unrest was the *Mixtón* War, waged by the Caxcanes and other seminomadic groups in the Chichimec Frontier to the North of Mexico City. The discovery of silver in Zacatecas in 1546 gave the incentive for Spanish colonizers to push towards the North to take advantage of the astounding wealth that would be generated by the discovered mines. But in order to make that advance, there would be a period of military engagement and gradual settlement with the establishment of cities and towns such as Querétaro or San Miguel. These towns ensured a logistics route to bring the silver to Mexico City. That incentive would only become even more powerful as the quicksilver method was devised, starting in 1555, making the new mines even more productive. It was not until the end of the century that Chichimeca War.

⁵As an example, we know that the settlement of Chipititlan in Colima gave eight jars of honey monthly. And that the settlements of Ayutla and Aticpac, from the *visita* XXXV, gave six and twelve units (*cargas*) of cacao yearly, respectively. We also know from this document that at least 25 settlements were grana producers. In specific cases, like Chiacompa from *visita* XXXV, we know that they gave 25 jars (*jícaras*) annually with a unit value of one peso.

Figure A1: An example of settlement descriptions in the *Suma de Visitas*



Source: Biblioteca Nacional de Madrid, MS2800. The entry includes information on the region the town belongs to, the *visita* number of its inspection (in roman numerals), and indications on whether the town works as a private *encomienda* or in the name of the Crown. After *visita* XXXV, settlements include information for both population and tribute. Usually there is some information on the physical geography, climate, and the goods paid as tribute.

a population or description, such as Tlatelolco or Cuernavaca. We therefore supplement for these with other contemporary sources as described below.

We have two main sources to obtain the population from 1548. First, we give primacy to the information from the original *Suma de Visitas* document (García Castro, 2013), where 1,346 unique settlements are mentioned. The document is organized listing 907 political units, with an explicit description of population and tributary characteristics given. Sometimes more than one settlement is mentioned in any given entry. This yields 1,158 places for which some level of information on population or tributary figures can be learned, although sometimes villages are subjects of the main cabecera town (65 of them) where the provided figures are aggregated to the higher jurisdiction. In that same source there are 172 towns that are only mentioned as geographic reference points. Although these towns do not have a description, they were well known at the time and clearly settled. (García Castro, 2013) refers to these as “pueblos colindantes”. Cook and Borah (1960) provide geographic coordinates for these towns, but they only give approximate locations for 440 of them. We have painstakingly geocoded every one of them, checking in various cartographic sources and historical lists as described in the appendix. In all, this original dataset yields population information uniquely reported for 1,109 settlements. The total of this population amounts to 1,439,443, using the conversion factors from Cook and Borah (1960). In relation to the units of analysis (i.e. AGEb localidades), the first source therefore provides population for 954 units, where 254 units of analysis contain more than one town from the original *Suma de Visitas* (most of these units with more than one town are located in the coasts and Northeast of Mexico).

The second source that we used to complement our original data is a list of 1,408 towns from the classic work by Cook and Simpson (1948). From the *encomienda* towns listed in

this source, 1,284 were given a population in 1548 by those authors, amounting to 2,893,522 inhabitants. The extrapolation that generates information for 1548, when the original source does not list a town, comes from crown pueblos and encomiendas listed in documents from the 1550s to 1570. Those posterior figures were adjusted by Cook and Simpson (1948) assuming that the number of inhabitants in 1548 was 30 percent higher. It is important to note that the later population counts are all made before the devastating cocoliztli pandemic of 1576. In that source the location of 871 towns is known. Including towns whose exact location is unknown, yields in the Cook and Simpson (1948) estimates a total population of 2,579,656 in 1548. After taking into account the information for the second source we get population information for 1,093 units of analysis. When one AGEB-Localidad coincides as the sole settlement, with only one population figure, we kept that number as reflecting the whole geographic region. When there are several towns within the same unit we use the average over the same unit of analysis from both sources. We are therefore always accounting for the population from the first source. Our final population for 1548 amounts to 2,598,516, i.e. approximately 80% more population than totaling the towns in the original *Suma de Visitas*, but around 90% of the total number estimated by Cook and Simpson (1948).

1.2 Process to verify locations

Our process to locate settlements started with the work of Borah and Cook (1960), followed by a series of checks using different methods and tools. We describe this process in this section.

Original data. Borah and Cook (1960) is our starting point to find the location of the settlements. In their work, they provided coordinates for the settlements in the *Suma de visitas*, and they marked settlements with approximate locations. As previously mentioned, there were 442 settlements without individual entries, which were mentioned in other descriptions as neighboring settlements.

Missing data. Borah and Cook (1960) identified coordinates for 1,060 settlements. However, of these, they flagged 378 settlements indicating that their information was uncertain. Further, of the 1,060 settlements, the dataset actually provides unique coordinates for only 193: many settlements are grouped together and assigned the same coordinate. Thus we need to adjudicate whether these settlements were distinct over time and space or were likely to be close in both human interaction and geographical terms, falling within the same rural AGEB or urban localidad. For example, in the *visita* LVIII, the settlement of Tlachinola has no coordinate and does not appear as a distinct settlement in any other source. Its adjoining settlement, within the same entry, of Tlapa, however, does have coordinates. Based on these two facts, we assign Tlachinola and its population to the same rural AGEB. We did this for 286 settlements.

Simple check with the map. We projected all the existing coordinates and checked if they made sense overall —i.e., being inside the territorial map of Mexico, as some coordinates

were in the water (ocean, lakes, or rivers). These settlements were moved 0.01 degrees (approximately 1.11 kilometers) in their latitude or longitude. The number of these settlements was eight.

Exact match with Atlas de Pueblos de Indios. The next step was to check if any of these settlements had an exact match with a name and state (*comarca*) in the 1790 Atlas (Tanck de Estrada, 2005), so we could update the coordinates if necessary.⁶ The names match for 432 settlements, but as these could refer to different towns with the same name, we also checked that the visita fell into the appropriate region as well. We only adjusted 10 settlements following this process. This is the case for many settlements and historical communities in the north of Oaxaca, as for example the settlement of Huautla in the *Suma de Visitas*, which is currently Huautla de Jiménez in the municipality with the same name.

It is worth noting that this process helped in corroborating our data at this and further stages. At least 84 settlements from the *Suma de Visitas* were validated from the Atlas' settlements because we adjusted their coordinates to areas very close (within 0.02 degrees) to the Atlas' *pueblos*, given the coordinates from the Atlas. From these 84 coordinates, we adjusted 30. Additionally, the Atlas' *pueblos* were used as a reference to see the clusters of settlements in certain areas in Mexico that have scattered populations. As a reference, 80.7% of the settlements from the *Suma de Visitas* had at least one settlement from the Atlas in a radius of 10 miles, 67.7% in a radius of five miles, and 56.2% in a radius of three miles.

The names of the settlements in the Atlas are closer to to the actual names; this is not the case with all settlements in the *Suma de Visitas*. These names were cleaned and checked with the Historical Archive of Geostatistical Localities by INEGI. This archive contains information about previous names for municipalities in Mexico.⁷

In some cases, where we did not find information in the historical archives, we verified potential current reference points that preserved a similar name to the one in *Suma de Visitas*, as for example the settlement of Tacuba that nowadays is part of the center of Mexico City. However, it is still possible to determine its previous location within the municipality that now encompasses Mexico's city center.

Visita routes. After completing the previous steps, we tried to increase the accuracy of the location of each settlement with an iterative process to locate all the settlements from the *Suma de visitas* in a route. As a first approach, we grouped all these settlements by the number of *visitas* to verify if they were in the same *comarca* or if there were any settlements that seemed too far away from the rest of the visita routes. After completing the route network, we adjusted 72 places in this way.

For the settlements that did have additional information, we used three more checks using data in the descriptions from the *Suma de Visitas*. In particular, we checked on consistency by checking: i) the geographical references, ii) the references to another settlement, and iii) the references to two or more other settlements. In some settlements, we used more than

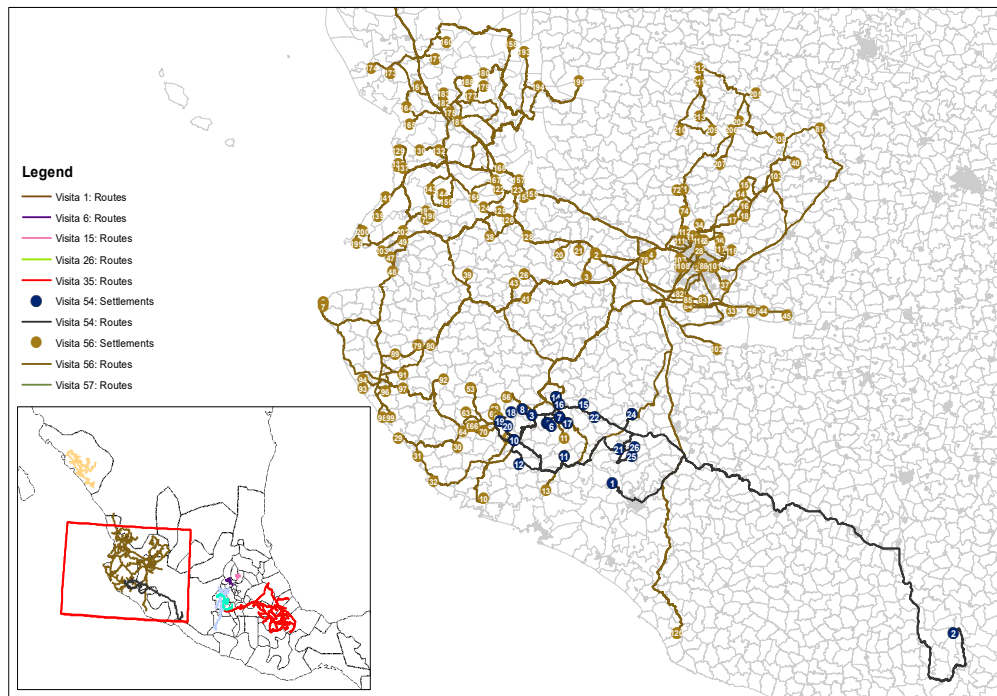
⁶The coordinates extracted from the Atlas are more precise for those settlements that survived.

⁷The Historical Archive of Geostatistical Localities is available at <https://www.inegi.org.mx/app/geo2/ah1/>.

one method. Overall, we used these methods for 422 out of the 442 cases with flags. For the rest, we used the name approach from the Atlas' *pueblos*. We used exclusively one method in 365 settlements, two methods in 53, and three methods in 4.

As for the geographical references check, in the descriptions there were usually references to the sea, mines, mountains, rivers, or lakes that helped us to verify the location or adjust them. From the 442 cases with flags, there were 53 settlements for which we used this method. Regarding the one settlement reference check, sometimes a reference of another settlement for which we had more certainty about its location was indicated in the descriptions. From the 442 cases with flags, there were 66 settlements where we used this method. Finally, many times the descriptions made reference to two or more settlements of which we had more certainty about their location. In some cases in which no more information was available, we took averages of the locations and checked with the route. From the 442 cases with flags, there were 21 settlements for which we used this method.

Figure A2: Example of routes in the Suma de Visitas



1.3 Examples

In the next paragraphs, we will list specific examples where we used the methods described above, according to the information available for each group of settlements.

Settlements located in Atlas.

One first example is contained in *Visita I*, whose corresponding route is located within the state of Mexico. Most of the mentioned settlements —as, for example, Jalatlaco, Ixtapan de la Sal, Malinalco, and Coatepec— preserve some part of their names from the 17th century, and could be found in maps from the 17th century or from today, particularly taking into account likely Spanish transliterations from Nahuatl and other indigenous vernaculars.

For example, the settlement of Guaxolotitlán is part of the *visita LXXX*, and given the route followed, it is likely that this is the same area as Santiago Huajolotitlán. Both have routes in the term “between turkeys” (in Spanish, “entre guajolotes”), resulting from the mix of *hueyxlótl* for “guajolote” and *titlan* for “entre”.

In contrast, the match for the settlement of Xucuçingo (mentioned in entry 419 in the *Suma de Visitas*) was not obvious based upon its name alone, as many settlements in Mexico have “ingo” as its suffix. However, after checking our predicted least cost paths of the Crown officials linking the neighboring settlements from the Atlas within that visit, we were able to identify a match: the modern settlement of Joquicingo.

Similarly, in *visita VI*, which lists settlements from the states of Mexico and Hidalgo, we could not locate Vllaspa (entry 781). After checking the least cost route and the neighboring settlements from the Atlas, the most likely settlement was the one from Otlazpa. A useful confirmation is provided from the *Suma de Visitas*, which mentions that this settlement is close to Tepexic (entry 538), the current Tepeji del Río.

Visita XV also contains settlements from the states of Mexico and Hidalgo. Using this *visita*, we could not locate Tlacachique (entry 547). Although its description is detailed, these details are not informative. For example, it says that there are not many maguey plants or that their mountains do not have firewood. Combining an inspection of the Atlas with the relevant climatic conditions point to the pueblo of Tecajique.

Settlements with useful geographical references.

Visita LVI, which contains settlements within the states of Nayarit and Jalisco, was particularly challenging as there are at least 213 settlements mentioned. The description of the settlement Xaltempa (entry 822) mentions that there are two “barrios” (neighborhoods), and one of them (Tepextlan) is up in the mountains. Considering this geographical reference, the *visita’s* route, and that there is one *localidad* that falls inside the route area (La Peñita de Jaltemba, in the municipality of Compostela) allows us to triangulate on the likely location. Another useful reference to further confirm our location derives from entry for the settlement of Tepetlahuaca (entry 700), which mentions that the settlement is located on the river bank of Ameca.

The information from the text was also helpful to avoid natural pitfalls that can occur if we had only used the name as the reference. For example, according to the description for the the settlement of Ocotlan (entry 434) in *visita LVI*, it is located a “legua” (league) and a half from Guadalajara. In the absence of this information, one might, based upon name alone, match this entry to the the municipality of Ocotlan, which currently encompasses a big city close to Guadalajara. However we dismiss this match based upon the description: as that settlement is too far (50 miles away) from the city of Guadalajara.

Another interesting example is *visita* LVII, whose routes are within the state of Sinaloa and contains at least the mention of 130 settlements. In the case of Ayauateto and Tabolato (entry 76), the description mentions that these two settlements are six “leguas” (leagues) from Culiacán and down to the river. Thus after checking the area and route, it seems feasible that these settlements are close to the *localidad* of Toboloto in the municipality of Navolato. In the case of Apoma and Apamimbo (entry 81), we also find that there is a *localidad* called La Apoma in the municipality of Badiraguato that it is inside the *visita*’s area, and that seems adequate to the route. For the geographical references for the route’s accuracy, we see that Tecuchamana (entry 723) mentions a mine, and we corroborated that there is at least a mine in the area. Also, the settlement Ayabuto (entry 72) mentions that it is down the river, consistent with the location of the Río San Lorenzo.

Triangulating from neighbouring settlements and intervening routes.

When georeferencing *visita* XXVI in the state of Mexico, we could not find the settlement of Talasco, which is only mentioned as a neighboring settlement of Toluca (entry 561). Nevertheless, in the description of Toluca, we know that Talasco and Huyçiçilapa (entry 782) are to the east of Toluca. Considering that we have a better estimation of the location of Huyçiçilapa (or Vçiçilapa), we can use these two points, along with the least cost path between them to provide an approximate location for Talasco.

Visita XIX in the state of Jalisco is an example of how we approximated locations using the locations of multiple other settlements, referenced in the descriptions. In particular, we could not find the settlement of Çapotitlan (entry 115). From the *Suma de Visitas*, we know that there is a lagoon and that there is a mountain four leagues away. After checking the Atlas and the territories, there was not a settlement similar in location or name, so we approximated its location by using the locations of the other two settlements mentioned in the *Suma de Visitas* as its neighbors: Tamaçula (entry 552) and Amula (entry 40). Fortunately, its description says that it is close to the city of Guadalajara.

Finally, when using *visita* XXXVI in the state of Mexico, one of its settlements (Tecalco, entry 515) mentions in its description the settlements of Calco and Viznauatengo, which we could not locate. Therefore, we checked the likely itinerary of the census officials based upon least cost paths linking settlements for which we have a better estimated location —both Tecalco and Chiconautla (entry 244)— and located Calco and Viznauatengo in a point along this route.

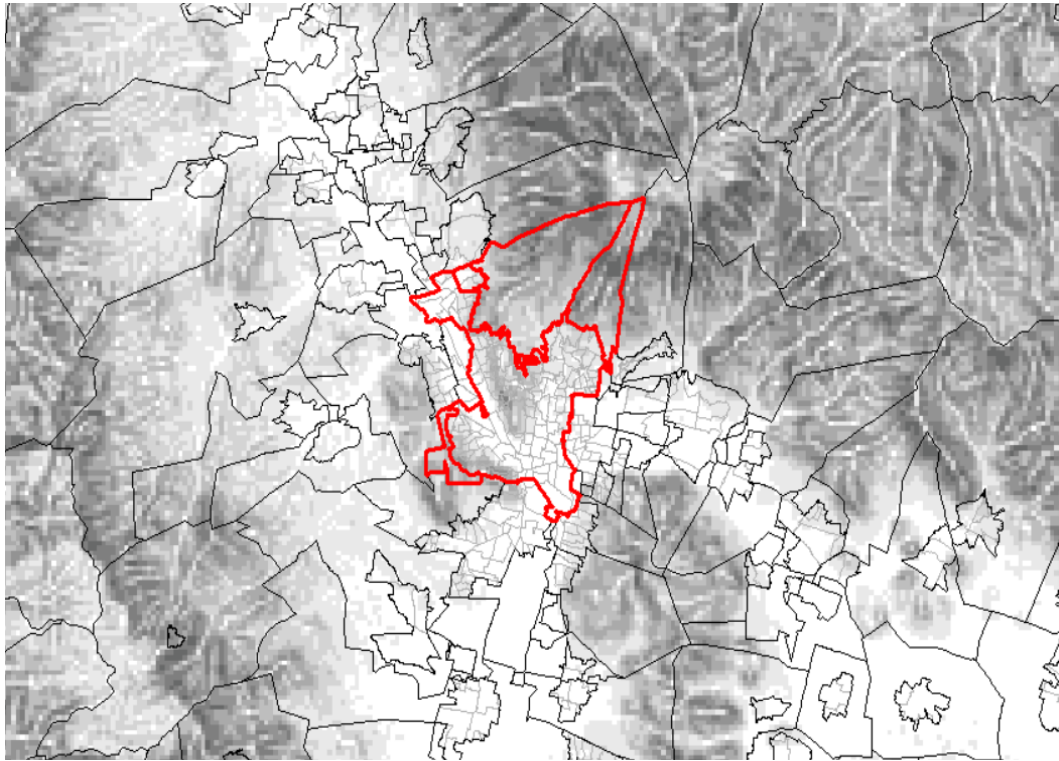
2 Units of analysis

1. **Geostatistical National Framework.** Mexico’s National Institute of Statistics and Geography (INEGI, Instituto Nacional de Estadística y Geografía) is the Mexican agency responsible of conducting the national census and economic surveys. For this purpose, it has designed the Geostatistical National Framework (Marco Geoestadístico Nacional) to reference all statistical information. This framework is formed by geostatistical areas at three levels: 32 state geostatistical areas (AGEE), 2,470 municipal geostatistical areas (AGEM) and 78,887 basic geostatistical areas (AGEBs). The lat-

ter is divided into urban and rural. Inside these levels, which may be thought of as equivalent to census tracts, there are geographical areas that contain the minimum observational units in the National Census: the locality (*localidad*) and the city block (*manzana*). We have created a unique partition of the national territory into a combined territorial landscape that includes full localities (that may be formed by many AGEBs) in urban settings and full AGEBs (that may be formed by many localities) in rural settings.

2. **Units of analysis** The historical data allows us to observe relevant information at the AGEB and locality level. When deciding which are to choose between AGEBs or localities, there are relevant considerations. In the one hand, urban AGEBs and rural localities represent small and detailed units of analysis distinguished with modern census information, but the small size of these units makes it impossible to find relevant data at this level in historical records. On the other hand, urban localities and rural AGEBs can still give us more information than municipalities and still find historical records that are located in any of them. We hence construct our dataset at a level that combines urban localities and rural AGEBs. As an example, in Figure ??, we can see an example for Oaxaca City, divided into the proposed units (in red) and existing AGEBs (in gray). The 5 units delimited in red include three that have no internal divisions, i.e. they are rural AGEBs, while there are two additional units with internal divisions, i.e. they are urban localities. Our proposed division yields 21,977 unique units, of which 11,888 lie within the historic core of Mexico. In the next Figure A3 we show the same unit of analysis of Oaxaca city, but delimited by the natural topography as depicted by a Digital Elevation Model of altitude. It is clear that the AGEB *localidad* units follow preexisting natural geographic features.

Figure A3: Map of Oaxaca with a Digital Elevation Model (DEM)



The remarkable persistence of territorial boundaries marked by geographic features that this figure exhibits should be clear to anyone familiar with the valley of Oaxaca, shaped as an inverted Y. The various rural AGEB units are delimited even today by markers (*mojoneras*) that run along specific hills into the drainage areas in their adjacent valleys. Those are visible in the figure along the darker DEM shades. Some other units correspond to flat areas at the bottom of the valley, delimited quite precisely by the piedmontal area, where the rugged mountains begin. The city of Oaxaca can be clearly seen as a larger urban locality, comprised of many urban census tracts, at the meeting point of the two mountain ranges of the Sierra Madre.

Table A1: List of sources

Variable	Primary Source	Secondary Source
PANEL A: Population and settlements		
Population 1548	<i>Suma de Visitas de los Pueblos por Orden Alfabético</i> (1548), <i>Biblioteca Nacional de Madrid</i> , MS 2800.	New paleography by Rene García Castro (2013), after the initial publication by Francisco del Paso y Troncoso (1905). Specific towns georeferenced and assembled together <i>Visita</i> by <i>Visita</i> correcting latitudes and longitudes provided in Cook and Simpson (1948b).
Settlements Mentioned in 1548	Same as above.	Same as above.
Population 1570	Juan López de Velasco (1574). <i>Geografía y Descripción Universal de Las Indias</i> . Ed. Marcos Jimenez de la Espada. Madrid.	Corrections of Cook and Borah (1960), revising the published version (1971) Ed. Marcos Jimenez de la Espada. Madrid.
Settlements Mentioned in 1570	Same as above.	Same as above.
Population 1646	<i>Archivo de los Duques del Infantado</i> , Papers of the Conde de Salvatierra, volume 54 pp 148-180, reported by Juan de Cervantes Casaus, Contador Mayor of the Tribunal de Cuentas (1646).	E. William Jowdy's microfilm collection of the Montesclaros papers at the SMU library. Geocoding corrections matching towns in Cook and Borah (1979) to align with sketch map of Cook and Borah (1960).
Settlements Mentioned in 1646	Same as above.	Same as above.
Population 1790	Many sources compiled by Tanck (2005), including the Revillagigedo Census (1790), the <i>Relaciones Geográficas</i> and multiple records in the <i>Archivo General de la Nación</i> and regional archives in Mexico.	Tanck (2005). <i>Atlas Ilustrado de los Pueblos de Indios</i> .
Settlements Mentioned in 1790	Same as above.	Same as above.
PANEL B: Geographical Data		
Tropical Climatic Zone	Mexican <i>Instituto Nacional de Estadística, Geografía e Informática</i> (INEGI) <i>Conjunto de datos vectoriales escala 1:1 000 000. Unidades climáticas</i> .	Extracted to the AGEB <i>localidad</i> level for the 2010 <i>Marco Geoestadístico Nacional</i> , INEGI.
Arid Climatic Zone	Same as above.	Same as above.
Elevation (km)	US Geological Survey EROS Data Center (GTOPO30).	Digital Elevation Model with a horizontal grid spacing of 30 arc seconds (approximately 1 kilometer) to calculate the topography (measured in meters) of the Mexican territory.
Average Temperature (°C)	<i>Unidad de Informática para las Ciencias Atmosféricas y Ambientales</i> (UNIATMOS) in the <i>Universidad Nacional Autónoma de México</i> (UNAM).	The most comprehensive dataset of climatic conditions for the country from 1902 to 2011. This information includes estimates for the average, minimal and maximum temperatures measured in centigrade degrees. The calculations are at a resolution of 926 meters, using daily instrumental meteorological data from 5000 stations of CONAGUA and SMN, based on the Worldclim methodology. The interpolation between stations is made using an IDW method.
Cumulative year precipitation (mm)	<i>Unidad de Informática para las Ciencias Atmosféricas y Ambientales</i> (UNIATMOS) in the <i>Universidad Nacional Autónoma de México</i> (UNAM).	Same methodology for the average rainfall.
Ruggedness Index	US Geological Survey EROS Data Center (GTOPO30).	Standard deviation of elevation.

Table A2: List of sources (continued)

Variable	Primary Source	Secondary Source
PANEL C: Resources and Agriculture		
Cochineal Production (around Conquest)	<i>Matrícula de Tributos</i> (ca 1530) in the <i>Biblioteca Nacional del Instituto Nacional de Antropología e Historia</i> (INAH), Mexico. <i>Código Mendoza</i> at the Bodleian Libraries, Oxford University, MS Arch Selden A.1. <i>Información de 1554</i> at the <i>Archivo General de Indias</i> (AGI) ES.41091.AGI/27//JUSTICIA,203.	<i>Código Mendoza</i> geolocated by Barlow (1949), <i>Matrícula de Tributos</i> Nahuatl annotations translation by Castillo Ferreras (1997) and <i>Información</i> transcription by Sholes and Adams (1957). Digital facsimile prepared by Brito and Gutierrez (INAH) 2015.
Cacao Tribute (around Conquest)	Same as above.	Same as above.
Maize Tribute (around Conquest)	Same as above.	Same as above.
Quetzal Tribute (around Conquest)	Same as above.	Same as above.
PANEL D: Characterizing settlements		
Independent Seniorios	Redrawing of the borders by Barlow (1949) and Davis (1968) for independent lordship, based on our own geocoding and correction of towns.	Same as above.
Spanish city	Spanish Cities as identified at the end of the colonial period in Tanck (2005).	Tanck (2005). <i>Atlas Ilustrado de los Pueblos de Indios</i> .
PANEL E: Distances		
To Tenochtitlan (km)	Euclidean distance to Tenochtitlan. Estimated with ArcGIS.	Calculated with Projected data.
To Port of Veracruz (km)	Euclidean distance to the port of Veracruz.	Same as above.
To Coastline (km)	Euclidean distance to Coastline.	Same as above.
To Rivers (km)	Euclidean distance to Papaloapan and Balsas (navigable) rivers.	Same as above.
To pre-Hispanic Roads (km)	A Least Cost Distance calculated using Tobler's upslope travel cost, combined with a small (1 percent) weight for archeological sites. The original output model was filtered with a "smoothing" function that removes sharp angles from lines. The resulting paths are ones that we could expect from pedestrian travel in an area that had few, if any, defined roads in the modern sense. Surplus roads were removed. The simplified predicted route highlights movement that would have been through other tribute sites towards the capital.	Own calculations.
PANEL F: Diseases		
Disease index for Yersenia Pestis	15 to 27°C temperature, 10mm daily rainfall, 500-900 to 1300 meters altitude, December to April.	Own calculation based on review of literature, particularly Schmid et al. (2015) and Ngeleja et al. (2017).
Disease index for Tabardillo (typhus)	16.5 to 26.8°C temperature, 5-13mm daily rainfall, early March.	Own calculation based on review of literature, particularly Gao et al. (2020) and Kuo et al. (2017).
Disease index for Hemorrhagic dengue	25 to 32°C temperature, 6-12mm daily rainfall, 8 weeks post rainfall.	Own calculation based on review of literature, particularly Colón-González et al. (2011) and Lozano-Fuentes et al. (2012).
Disease index for Cocoliztli (1576)	Calculated from the Mexican Drought Atlas using a 0.5 of a degree grid of longitude latitude point estimates of the Palmer Drought Severity Index (PDSI), Stahle et al. (2016).	Following Garfias and Sellars (2020)

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